SCIENTIFIC AMERICAN

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THE 155th STREET VIADUCT, NEW YORK CITY, N. Y.

The part of New York City north of 125th Street and west of 9th Avenue is cut off by its altitude from convenient access, except at one or two points. A good grade can be followed to the north from 125th Street, and an approach of fair grade can also be found leading from the north by way of Kingsbridge. Thus an immense tract of one of the most attractive regions of the city is almost isolated. The ground is largely made up of gneiss rock, and already much of it is well built up with beautiful residences, surrounded by grounds of the suburban type. Even from the Hudson River the grades are almost prohibitive as regards heavy loads. This portion of the city is destined always to be the seat of elegant residences, and is even now the center of very active building operations. The high elevation and nature of the ground make it a peculiarly healthy and attractive spot, and it already feels the need of better communication with the rest of the city. The portion near 155th Street is termed Washington Heights.

When the Harlem River improvement shall have been carried out, quantities of building material, coal, and other goods for this region, now, to a great extent, cut off from the rest of the city, should properly be discharged upon wharves along the bank of the new Harlem channel. The shore of the Harlem River, as shown in the map, near its intersection with 7th and 8th Avenues, will unquestionably be the location for extensive dock and bulkhead work. It represents the nearest available point for general distribution to the high ground on the west.

Parallel with 8th Avenue, and lying about 700 feet to the westward, is the base of the great ridge, which rises steeply from the level ground formerly called Harlem Plains. The steep ascent cuts it off from this part of the city. To draw a load up the hill a team has to be taken a mile or more to the south of the point shown on the map before it can begin the ascent, either on St. Nicholas Avenue or the Boulevard. From 125th Street north to the Harlem River the hill is only practicable for light loads.

Some years ago a wooden foot bridge was erected that ran from the 155th Street station of the 8th Avenue elevated railroad to the hill. This for some years bridged over the low ground, but was eventually removed. The city authorities have now taken the matter in hand, and are erecting an iron viaduct which will supply the want, and which will provide a good road of easy grade for horses and pedestrians upon the line of 155th Street. We illustrate in our present issue some of the principal features of this work, which assumes peculiar importance in its connection with future operations, such as the Harlem River improvement and the new bridge over the same river at 7th Avenue.

The map shows the general features of the ground. St. Nicholas Avenue at this point, after a long ascent, has nearly reached the crest of the ridge. St. Nicholas Place and the Edgecomb Road mark the starting point of the viaduct. It runs down 155th Street over the tracks of the elevated railroad on 8th Avenue, and reaches McComb's Dam Bridge at 7th Avenue. Here a

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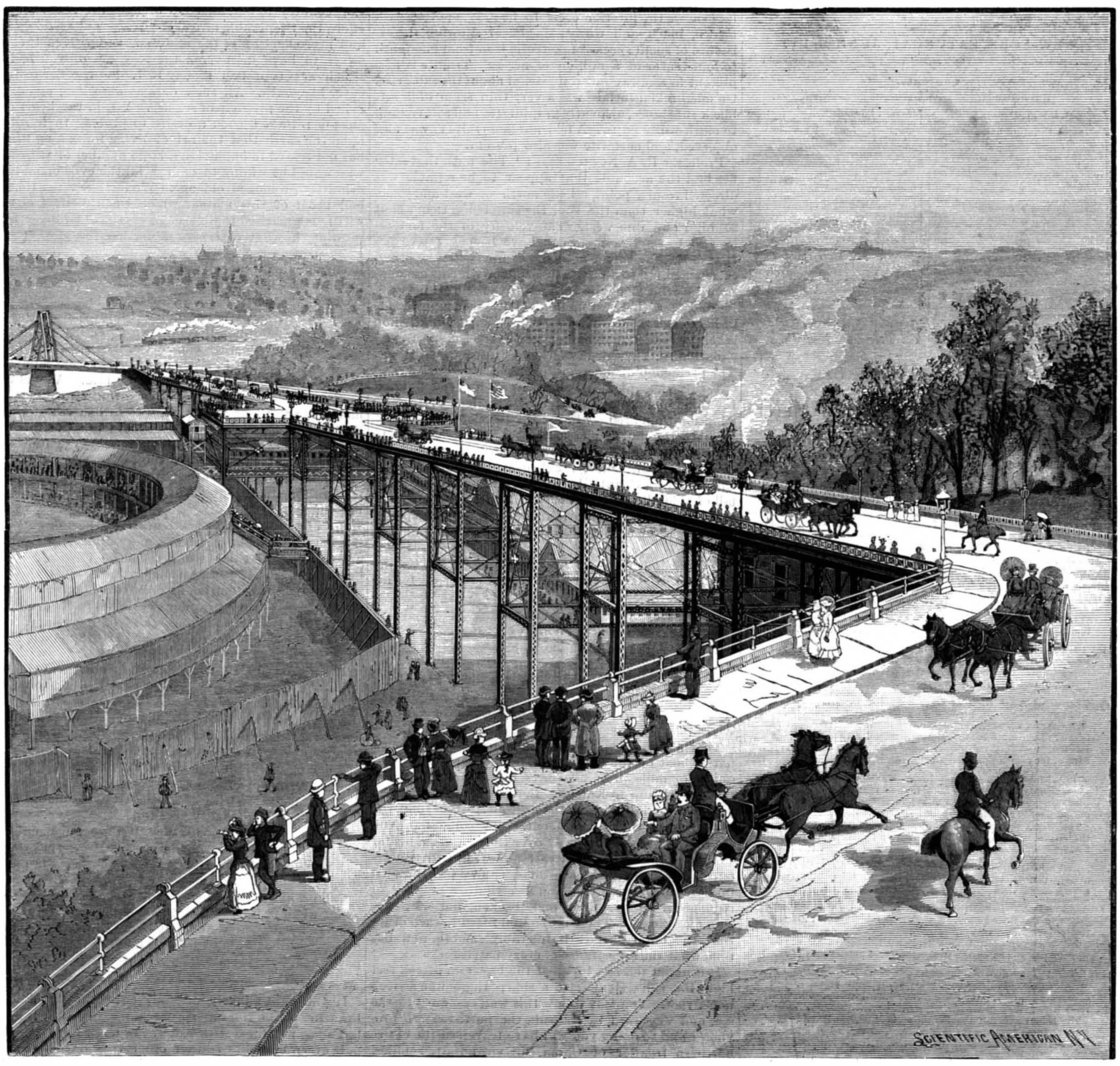

NEW VIADUCT FOR CARRIAGES AND PEDESTRIANS, CONNECTING WASHINGTON HEIGHTS AT 155TH ST. WITH McCOMB'S DAM BRIDGE.

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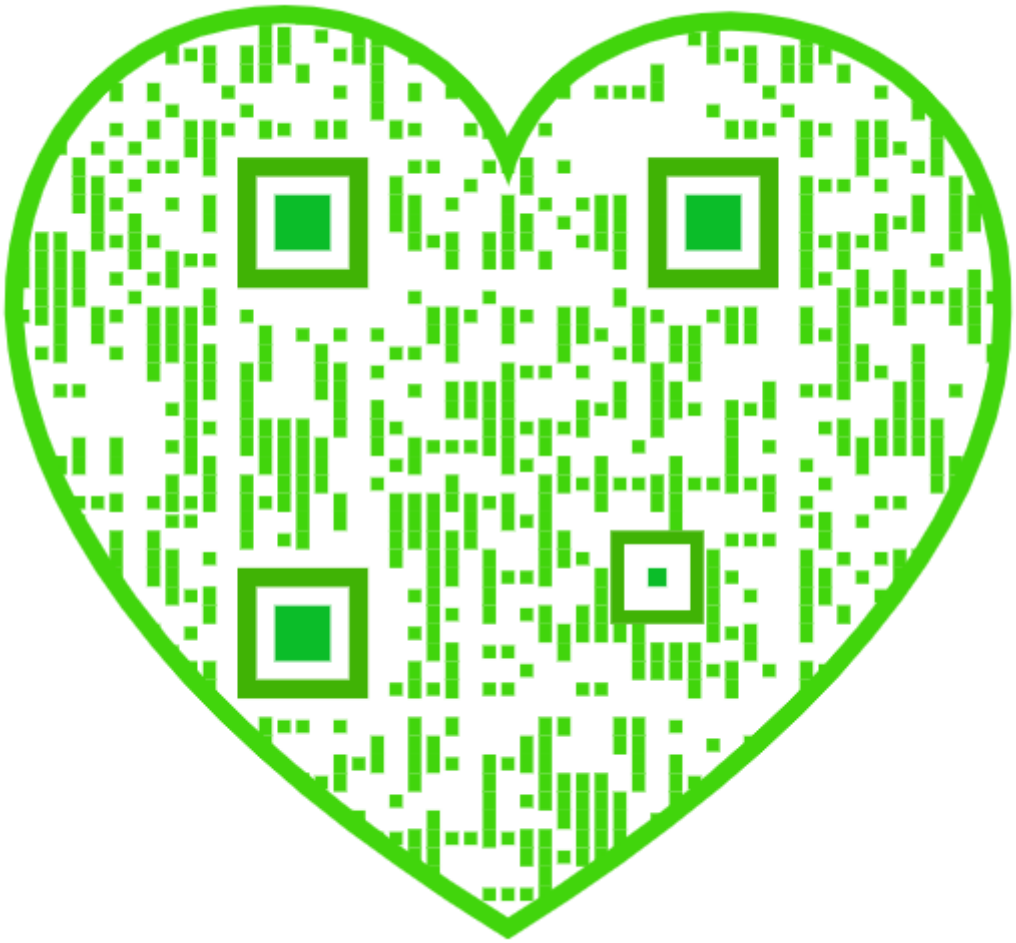

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THE WINNEBAGO COUNTY (IOWA) METEORITES.

On Friday evening, May 2, 1890, at 5:30 P. M., standard Western time, a meteor was observed over a good part of the State of Iowa, and is described as a bright ball of fire, even in the sunlight, moving from west to east, leaving a trail of smoke which was visible for some minutes. It was accompanied by a noise likened to that of heavy cannonading or thunder; and many people rushed to the doors, thinking it was the rumbling of an earthquake. Substantiated reports have been received from Des Moines, Mason City, Fort Dodge, Emmetsburg, Algonia, Ruthven, Britt, and Forest City. The noise was also heard at Sioux City. Some of these places were at a distance of over a hundred miles from the point where the meteor fell. It exploded at Leland, about eleven miles northwest of Forest City, Winnebago County, in the center of the northern part of Iowa, latitude 43° 15', longitude 93° 45' west of Greenwich, near the Minnesota State line. The fragments were scattered over a considerable surface of ground. Up to the present time there have been found a 66 pound mass, a 10 pound mass, two 4 pound masses, and 500 fragments weighing from one-twentieth to 20 ounces each, one lot of twenty masses weighing only 12 pennyweights. A part of the main mass of the meteorite is believed to have passed over into Minnesota. The pieces are all angular, with rounded edges.

This meteorite is a typical chrondite, apparently of the type of the Parnallite group of Meunier, which fell February 28, 1857, at Parnallee, India. The stone is porous, and when it is placed in water to ascertain its specific gravity, there is a considerable ebullition of air. The specific gravity of a fifteengramme piece was found to be 3·638. The crust is rather thin, opaque black, not shining, and, under the microscope, is very scorious, resembling the Knyahinya (Hungary) and the West Liberty (Iowa) meteoric stones. A broken surface shows the interior color to be gray, spotted with brown, black, and white; the latter showing the existence of small specks of meteoric iron from one-tenth to four-tenths of a millimeter across. Troilite is also present in small rounded masses of about the same size. On one broken surface was a very thin seam of a soft black substance, evidently graphite (?), and soft enough to mark white paper. A feldspar (anorthite?) was also observed, and enstatite was also present.

Professor H. A. Newton says: "The path that satisfies best the accounts that appear to be reliable was directed from a point a little north of west and somewhat higher than the sun, the sun being then about 20° high and due west. The velocity of the meteorite may be safely assumed to have been greater than that of Encke's comet at distance unity, and less than that belonging to a parabolic orbit. With this assumption the orbit would be inclined to the ecliptic between 10° and 20° with direct motion. The ascending node is in longitude 42°.5. The body had passed perihelion several weeks, how long depends mainly upon the inclination to the horizon of the path through the air. The perihelion distance was probably between 0·50 and 0·70, this element also being largely dependent upon the same inclination. Better observations of thin inclination than are now in hand are hoped for."

This is the fourth meteorite that has been seen to fall in Iowa. The other three falls were as follows: At Hartford, Linn County, February 25, 1847; at West Liberty, Iowa County, February 12, 1875; and the great fall of siderolites at Estherville, Emmet County, May 10, 1879, which fall comprised over two thousand pieces weighing from a tenth of an ounce to four hundred pounds.

We are indebted for the foregoing to Mr. George Frederick Kunz; he has secured over 300 pieces for his collection.

The Great Wall of China.

The Rev. Wm. P. Sprague, of Kalgan, North China, writes as follows to the *Missionary Herald:*

If any one doubts the existence of China's great wall, let him come with me to Kalgan, and see for himself the identical wall built by the first Emperor Chin, in 200 B. C.

Take a steamer across the Pacific to Tientsen, then a native boat up the Pei Ho River three days, then pack saddle or mule litter five days more, through mountains and plains to Kalgan. Before you reach the city you see a dark line along the hilltops just beyond the town, and by the time you enter our compound you see the wall stretching away over the mountains as far as the eye can reach, both east and west, with towers on all the prominent elevations. As we pay it a visit for closer inspection, you find it a windrow or ridge of reddish-brown porphyry rock broken, not cut, into irregular blocks. These are so well fitted to each other that the outer surface is tolerably smooth, and has somewhat the appearance of crazy patchwork.

It is about ten feet broad at the base and fifteen feet high, the sides sloping to a sharp ridge like a steep house roof. You may follow this wall eastward to the sea, and westward to Kansuh, the northwestern province; and so doing you will have traversed the entire northern frontier of China, fifteen hundred miles. Though you find several hundred miles of adobe sun-dried mud wall, yet other hundreds of miles are of good brick and higher than at Kalgan By the time you have traced its length you will be willing to concede not only that China has a great wall, but also that the ruler who could conquer so vast a country, drive out the invading Tartars, and build a fortification fifteen hundred miles long to keep them out, was worthy to be called the first emperor, and to give his name (China) to the country.

If any one laughs at the folly of spending so much labor on such a useless defense, let him remember that it was a defense only against horseback riders, armed with nothing but bows and arrows. A few guards on the watchtowers could, with their signal fires on the mountain tops, easily rouse the villagers, far and near, to the defense of their homes. And this wall accomplished its purpose for over a thousand years, when the great Ghenghis Khan with his brave Mongol followers broke their way through.

This section of the great wall becomes for half a mile the city wall of Kalgan. A beautiful temple is built on this wall to celebrate Ghenghis Khan's victorious passage.

This two thousand year old wall is little known to the world at large, because there is another wall much oftener visited and described by visitors from the western world. It is near Peking and a far more imposing structure. This is only an inner arm of the great wall, but five hundred miles long, and not so old by seven hundred years. It is built of cut granite and good brick, and is thirty feet wide at its base, twenty-five feet wide at the top, and thirty feet high. It is a fine sight as it winds over the highest mountain tops.

The Art of Living to a Great Age.

The enchanters of China promised the emperors of that country to find an elixir of long life that should efface the irreparable inroad of years. The astrologers and necromancers of the middle ages flattered themselves to have discovered the fountain of youth, in which a person had merely to bathe in order to recover his youth. All such dreams were long ago dispelled by the progress of science. Yet, in the heart of most men there is such a desire to prolong their stay upon the earth that the art of living for a long time has not ceased to impassion a large number of persons who would be willing to endure all the evils of an indefinitely prolonged old age. We have several times had proof of this mania, which Dean Swift has so wittily stigmatized in his second voyage of Gulliver, by showing in what a state of abjection the mortals of Laputa lived—those unfortunates who were condemned to survive their own selves through the loss of memory of what they had been.

One of the perpetual secretaries of the Academy of Sciences has written a volume to prove that man should consider himself young up to eighty years of age. A noble Venetian named Cornaro spent twenty years in a scale pan in order to ascertain what alimentary regimen was best adapted to him. We have known old men who, having learned that Mr. Chevreul had never drank anything but water, took the resolution to abstain wholly from wine, hoping in this way to exceed a hundred years. Fortunately, a rag gatherer, who reached the same age as the celebrated academician, spared them this sacrifice by informing his confrere in longevity that he had never drank anything but wine.

But of all these whimsical tentatives, there doubtless is none more worthy of exciting our risibilities than the one to which the Society of Hygiene, of Vienna, is now devoting itself. In fact, this association has just started an extensive investigation in order to determine what it is necessary to do in order scientifically to prolong life beyond the ordinary limits and to rival the patriarchs of the Scriptures, as compared with whom Mr. Chevreul himself was but a child.

The Society of Hygiene has therefore drawn up a circular which it has sent to all the old men of Germany and Austria-Hungary occupying a certain position in the world, and which contains a multitude of questions about their regimen, their habits, the duration of their intellectual work, the nature of their recreation, their manner of clothing themselves, etc. The good Viennese hope in this way to get up a practical manual designed for those who wish some day to double the formidable cape of eighty years.

We wish the hygienists luck, but we much doubt whether this tentative will have the effects that they anticipate from it, so great are the differences in physical aptitudes and in the occupations of each person.

The prolongation of human life is in itself a desirable result when it is obtained, in a manner, by a series of progressive measures, and not by an *ensemble* of minute precautions which would make life a sort of anticipated hell.—*La Science Illustrée.*

IF you want a lovely odor in your rooms, break off branches of the Norway spruce and arrange them in a large jug well filled with water. In a few days tender, pale green branches feather out soft and cool to the touch, and giving the delightful health-giving odor.

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Mounting Photographs.

Procure from your grocer a supply of "flour of rice" (I don't mean rice starch), take two tablespoonfuls, and with a little water work it up into a nice thick cream in a common bowl. When this is done, and it is seen that there are no lumps, go on adding water to the extent of about twenty ounces. Keep well stirred, and add a teaspoonful of powdered alum when quite dissolved. Take a suitable enameled pot or other clean one, such as in Scotland we make our porridge in, stretch over the top of it a piece of coarse muslin, and pour through the same into the pot the rice flour and water. While these operations have been going on a little gelatine, about twenty grains or so, is to be softened in clean cold water. When quite soft place this also in the pot and add thirty drops of oil of cloves. Place over a gas stove or bright fire free from dust, and bring gently to the boil, stirring well all the time. When the boil is reached the result will be a nice thin paste. If too thick, it must be thinned down by the addition of water at this stage and gently boiled a little longer. I may just describe that when the paste assumes a thickness of the consistency of thin treacle, or when it will of its own accord permit its being poured from the pot direct into a wide-mouthed bottle, it will at the end of the operation be about right.

If it is seen that at this stage the paste is of the right thickness, add one ounce of alcohol, and when the same is well stirred and incorporated with the paste, pour the whole into a wide-mouthed bottle, set aside to cool, and when quite cold you have a permanent mountant that will delight the heart of the most fastidious operator. Let me add, then, when cold and going to use it, the same should be taken out of the bottle with a spoon and placed in a saucer or cup and beaten up with the hog's hair mounting brush, the bottle being carefully corked again till future use. A dirty or used brush should not be allowed to go into the bottle or remain there, as we so often see done with common gum bottles. If such little precautions as these are attended to, the stock bottle will keep good indefinitely, and the amateur or professional, wherever he may be, will have on hand always a stock of as good a mounting medium as the world has ever seen.

The color of this paste is one of its great points, while it has very excellent adhesive properties. A print, if carefully brushed over round the edges, will never lift, provided the mount is what it ought to be.

I now proceed to give a few hints, which I believe are not generally known to the great bulk of amateurs, or professionals either for that matter, on the mounting of prints in optical contact on glass.

First of all get your glasses thoroughly clean and dry, and be sure they are free from dust. When quite dry, brush over the surface of them a quantity of mounting medium, work this well on to the face of the glasses, and set aside for a few moments while you give a similar treatment to the "face" of the print, which ought to be damp. When the face of the print has been well brushed over with the medium, it is placed face down on the prepared side of the glass. I feel it is at this stage that many have gone wrong in their attempts to mount their prints in optical contact with cold starch. Were a squegee to be applied to the back of the print in this state, it is just about ten to one it would result in the tearing of the print by the friction of the rough surface of the back of the paper with the rubber of the squegee; but once this difficulty is recognized, and a simple means adopted whereby some efficient lubricator is brought to bear on the back of the print that will permit of the squegee slipping nicely along its surface without any fear of tearing, even when a fair amount of pressure is applied, the difficulty will be at once solved. I remember once when giving a demonstration to a photographic society how pleased a gentleman was to find what a little matter stood between him and success in his endeavors to put his prints on to glass by this means. Now the secret of success lies in not only brushing the cold mountant over the face of the print, but the back also. When the print is placed face down on the glass, take the brush and apply a good dose of mountant to the back also. This done, the squegee will slide most beautifully, and no tearing of the prints results.

For many years I have mounted all my prints in optical contact in this manner, and have often smiled when being told that I used hot gelatine for it. I find my prints keep quite as well as those mounted with gelatine, and no one can tell the difference. If the face of glasses and prints are free from grit or grease, there will be no slug markings. I can confidently recommend those who have a supply of old negatives or spoiled glasses to utilize them in this manner.

So much for placing the prints on the glasses. When dry, a neat appearance may be given to the pictures by binding round the edges of them a suitable colored paper. Most artists' colormen keep a supply of gold and other colored papers, and a few pence will acquire a sufficiency of such to bind a lot of pictures. Having made up your mind as to the color of the paper, cut even strips of same about one inch broad, and having provided some cardboards the same size as the pictures as a backing (or another spoiled glass the same size as the picture will do equally well), bind them together just like a lantern slide. When dry, a small ring or piece of ribbon may be attached to the backs to hang the picture by.—*T. N. Armstrong, in Brit. Jour. of Photo.*

Key West and Yellow Fever.

In Surgeon-General Hamilton's abstract of sanitary reports. No. 11, March, 1890, there is a report by Dr. J. L. Posey upon the sanitary condition of Key West, Fla., from which we make the following extracts:

The city of Key West covers an area of 1½ square miles of the island, which is 7 miles in length and 2 miles in breadth, and is between latitude 24° 32′ 58″ and longitude 81° 48′ 4″, 80 miles distant from the city of Havana and 230 miles from the port of Tampa, Fla. The entire island is a coral rock formation (oolitic limestone) rising at a slight elevation out of the waters of the Gulf of Mexico, constantly swept by strong and varying winds, and its atmosphere tempered by the Gulf Stream. The products of the soil are tropical in character, lofty cocoanut and date palms, cactus trees, wild fig, and Indian-laurel and many handsome flowering shrubs thrive in the gardens; low brush thickets of buttonwood, acacia, and mango cover the uninhabited area. The climate of this island is delightful, and is unexcelled, I think, in any section of the United States of America, with an average winter temperature of 70°, and 85° in summer. The surface of the island is generally level, with slight undulations north and south, east and west. The estimated population is 20,000 souls, comprising Anglo Saxons, Cubans (Spanish creoles), negroes, and mulattoes, the Cubans and negroes predominating. The manufacture of cigars and the sponge fisheries constitute the most valuable industries. After a thorough and systematic sanitary survey of this city, covering some weeks, and in which I was materially assisted by Dr. C. B. Sweeting, port physician, I find that there are many evils to condemn, and very few features in municipal sanitation to commend. The general condition of the principal streets is cleanly, but badly graded and imperfectly drained, and during the rainy season most of them are flooded, making it impossible for pedestrians to get about dry shod. On many of the streets there are no sidewalks and no drains. The average condition of premises, as seen from the street, is among the intelligent and better classes of Americans and Spanish creoles clean and well kept, and contrasts forcibly with the filthy yards and alley ways where the negro and Cuban population, employes of the cigar factories, are huddled together in small huts and shanties, and whose stolid apathy and utter indifference to even ordinary personal cleanliness and domestic hygiene and sanitation is apparent. In the majority of instances the garbage, refuse of kitchens, and a variety of offensive material, when not cast loose into the narrow streets or alleys, is heaped under their wretched hovels to undergo a slow process of moist decomposition. The yards of many of these dwellings after the heavy tropical rains are inundated, the contents of the shallow cesspools, mingling with the festering garbage, are floated abroad to be subjected to the rays of a tropical sun, which promptly distills an abundance of mephitic vapors, whose baneful influence is in part happily diminished by the constant disinfection of the winds from the sea that sweep over the isle.

One of the main sources of atmospheric pollution, as well as of the soil (which, though rocky, is more or less porous), is the privy vault system which is in vogue here. These vaults are dug to a depth of 4 to 6 feet, 3 to 6 feet in length, and about 2½ feet wide. I have ascertained that where the premises are small, the house occupying the greater portion of the lot, after the cesspool was filled it was covered over with sand and broken rock and a new one dug, and the practice repeated until many small yards were honeycombed with these fecal pools, and the important question to tenant or owner arose where to locate the next receptacle for human dejecta. This is certainly a deplorable system, and must be productive of foul atmospheric conditions in dwellings in a latitude where the thermometric markings range from 60° to 90° Fahrenheit the entire year. The water supply for domestic purposes is obtained from underground reservoirs excavated in the rock and cemented, which receive the washings from the roofs of dwellings during the prevalence of heavy tropical showers of the spring and summer months. In the poorer classes of premises the privy vaults are not many feet distant from these subterranean cisterns, and during periods of drought and in badly cemented reservoirs it is possible that by seepage from the closets the water may become contaminated with organic matter. I am of opinion that during the dry season water obtained from these reservoirs bears some close relation to the production of types of continued fever (non-malarial in character), presenting some typhoidal symptoms. There are several large covered drains in different parts of the city, one on Simonton street, leading from the head of Eaton street to the sea, and another on Angela street, extending to a salt pond in the rear of quarters used by the sergeant in charge of Fort Taylor. The history of sickness along the course of these drains is well known to many old residents.

The history of yellow fever in Key West (being the most exposed point in the United States) dates from a very early period. The frequent occurrence of epidemics of this disease, the recurrence of isolated cases between epidemic periods, its recent reappearance in October, 1889, and during the month of January, 1890, point, in my opinion, to but one rational conclusion—that the disease has finally become endemic in Key West. What constitute the principal factors involved in the production of this condition are matters of the first consideration: First, the very unsanitary conditions of the city yield a favorable nidus for the propagation and preservation of the germs of this disease; second, certain classes only of the population furnish the pabulum which evinces the presence of the apparently inactive and latent poison of yellow fever. I believe that only a thorough and vigorous cleansing of the city will rid it of the strongholds of disease, which will otherwise increase in number, and during the summer season develop the epidemic state, unless the municipal government of Key West begins at an early date to rid their rich and growing city of this "pest of the tropics," which was originally introduced on their island by infected vessels and by their creole industrial classes, but which, owing to years of criminal apathy and sordid indifference to the simplest laws of sanitation, has become (finding a congenial nidus in the filthy inhabited areas) at last domesticated.

The city of Key West is the only point in the United States that continues to harbor this "dreaded infection," and is coming to be noted as a great manufacturing center of the fragrant "conchas, principes, and regalias," and also the distributing focus of yellow fever fomites. A formidable rival of Havana in the manufacture of tobacco, she will soon enjoy the unenviable reputation, from the view of the sanitarian, of an equally active competition in the production of the "microbe." As long as her citizens are willing to live without the adoption and execution of such modern sanitary reforms as scientific sewerage, good drainage, abundant and pure water supply, cremation of garbage, well-graded and clean thoroughfares, public parks, improved domestic hygiene, so long will her sister cities on the mainland secure the dollars of the tourist, invalid, and capitalist. A system of sewerage, which seems entirely practical and efficient, is contemplated by the present municipal council, who were especially appointed to carry out the needed sanitary reforms, and the taxpayers should demand that the work be commenced and completed as soon as the funds voted for that purpose are obtained. The city has issued bonds to the amount of a half million, which is to be devoted to this general sanitary improvement.

In concluding this report I cannot refrain from expressing as my conviction that yellow fever is a preventable disease, and that its intimate relation to foul and filthy conditions of soil in towns and cities is no longer a surmise, but a fact, and that this city has become temporarily an endemic center from such conditions, and will so remain until they are removed.

The people of the United States cannot permit the city of Key West to remain a center of infection of the "fiebre amarilla" or "fiebre perniciosa," the prevalence of which among the infantile population of the island city, and the strangers within their gates, excites no alarm or fear among the heterogeneous inhabitants of this island. The State and national health authorities will, if this condition prevails much longer, be forced to adopt the same measures against Key West as are enforced against the infected ports of the island of Cuba.

DECISIONS RELATING TO PATENTS.

U. S. Circuit Court.—District of Minnesota.

MCCORMICK HARVESTING MACHINE COMPANY *v.* MINNEAPOLIS HARVESTER WORKS.

Nelson, J.

An inventor who first conceives and gives expression to the idea of an invention in such clear and intelligible manner that a person skilled in the business could construct the thing is entitled to a patent, provided he uses reasonable diligence in perfecting it, as against an inventor whose conception was of later date, but who was earlier to apply for a patent.

An inventor is entitled to a reasonable time, to be judged of according to the circumstances of the case, in which to perfect his invention and reduce it to practice without impairing his claim to priority.

"I NOTICE one thing," says an observant manufacturer, "and that is that hard wood logs, especially oak, that have been placed in the water immediately after cutting and allowed to thoroughly soak, make brighter lumber, with less tendency to sap stain, than that from logs that are left on the ground for several months. I find, also, that in green logs, if sawed immediately after cutting, and the lumber is thoroughly steamed preparatory to placing it in the dry kiln, the same results will be obtained, greatly enhancing the value of the lumber for fine finishing purposes.

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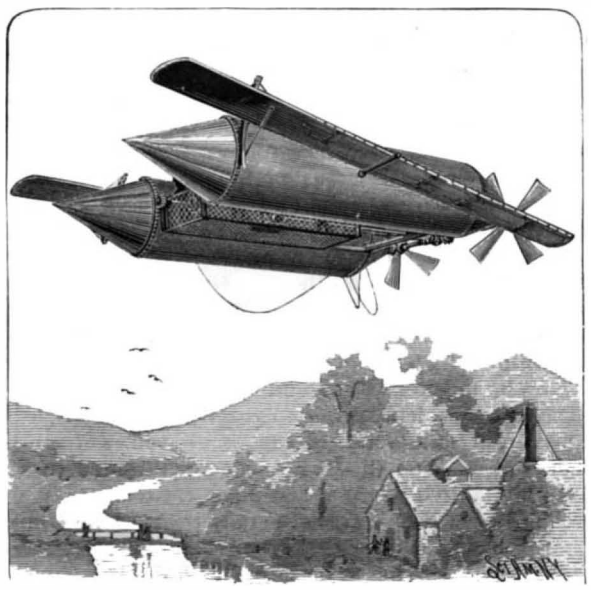
A DEVICE TO NAVIGATE THE AIR.

The aerial catamaran herewith represented has been patented by Mr. Charles E. Bechtel, of Udall, Kansas. It has two cylinders adapted to hold a buoyant material, and connected by a light frame beneath which is stretched a platform of woven steel wire supporting an electric or other motor designed to drive a rearwardly extending shaft which operates two propeller blades. To the outer sides of the cylinders are connected wings, pivotally mounted on horizontal shafts, the

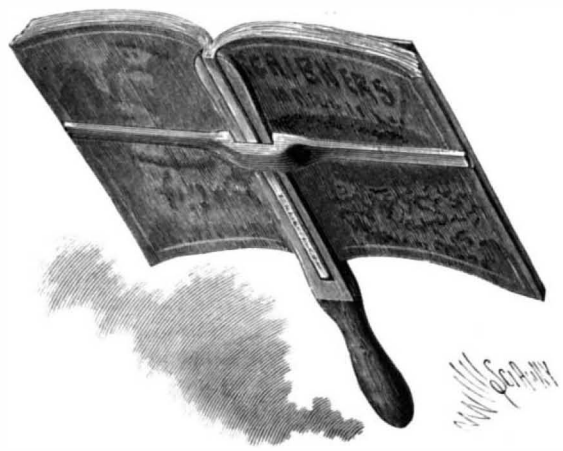


BECHTEL'S AIR SHIP.

wings carrying racks engaged by annular gears in guideways carried by the cylinders, whereby the wings may be inclined at such angle to the horizontal line as may be desired. In operation it is designed that the cylinders shall be just sufficiently buoyant to not quite overcome the attraction of gravity, when, the wings being set at the desired angle, the motor is started to drive the ship by the action of the propeller blades, the upward and downward motion being regulated by the inclination of the wings, while steering to the right or left is effected by disconnecting either the left or right propeller wheel from the motor shaft.

AN IMPROVED BOOK HOLDER.

The illustration represents a light, inexpensive, and convenient portable device, which may readily be



STRIPPEL'S MAGAZINE AND BOOK SUPPORT.

clamped to a magazine or other book having a flexible cover, and thus afford a handle whereby the book or magazine may be supported in proper position for reading. It is a patented invention of Mr. John Strippel, of No. 107 West Twenty-ninth Street, New York City. The device is preferably made of hard wood, somewhat elastic, and the handle bar, which forms the central portion of the support, has a slot adapted to receive the back of the book or magazine, such slot being wider near the handle than at the outer end of the bar, thus forming spring limbs. The outer edges of these springs limbs curve slightly outward, from near the handle to the other end, and are beveled on each outer edge. A dovetail grooved locking bar is adapted to fit over the beveled portion of the handle bar, the size of the dovetail groove of the locking bar being such that as it is pushed forward it will press the spring limbs of the central bar inwardly, and clamp them upon the back of the book or magazine placed in the slot. The locking bar can be readily released from the handle bar, when the parts may be conveniently carried in the pocket.

A RECENT number of the *Northwestern Lumberman* contains one hundred pages, and includes a lumber trade directory, also descriptions of some of the larger lumber establishments. Toledo, Cleveland, and Chicago are especially favored, over fifty superb engravings being given, illustrating the most notable lumber yards. The vast extent of the lumber industry in this country is well exemplified in the pages of our enterprising contemporary.

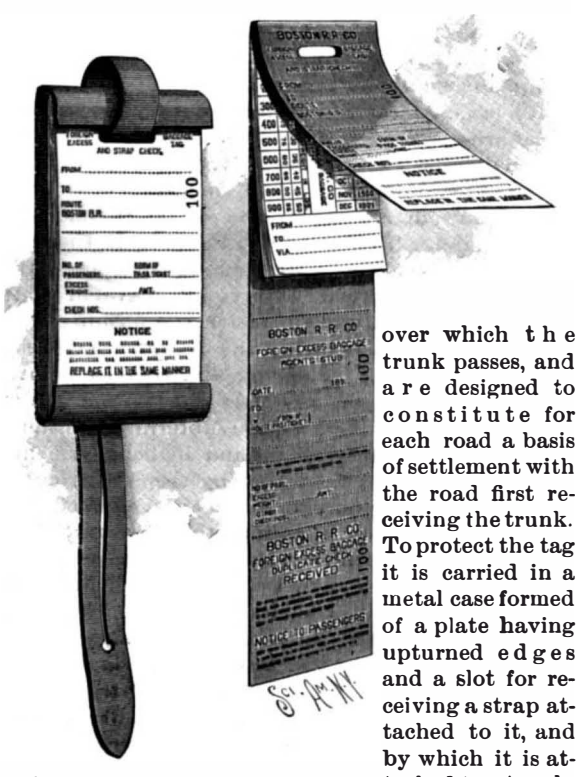
Metamorphoses of Fleas.

Mr. W. J. Simmons read before the Microscopical Society of Calcutta, March 5, 1888, an interesting paper on "The Metamorphoses of the Dog Flea," which has since appeared in the *American Monthly Microscopical Journal*. He presents some novel phases of flea life, well calculated to excite one's interest in these quite generally anathematized insects. It is stated that there are twenty-five different species of fleas; the dog, cat, fowl, marten, rat, squirrel, hedgehog, mole, pigeon, and bat each having its own species, while it is a curious fact that there are also vegetarian species, two of which are mentioned. One of these latter lives in brushwood, while the other is a lover of mushrooms. Besides these, the flea which attacks man has not been mentioned, to which must be added the jigger of tropical America, this being also a true flea. Mr. Simmons makes a considerable point of the order of length of the tarsal joints in the classification of fleas.

Following his notes on the transformations of the dog flea we find: Eggs were deposited early in the morning of October 17, 1886. These were put in a glass and covered with a pane of the same material. On the morning of October 19, about fifty hours after deposition, most of the nits had hatched out, but a few took twenty-four hours or so longer. The majority, therefore, required only a little more than two days as their period of incubation. The larvæ were white, eyeless, cylindrical, active grubs; their bodies, exclusive of the head, with thirteen segments. These segments are beset with long hairs, the terminal segment ending in two curved spines, which probably aid the larva in locomotion. They were supplied with no food except blood pellets (the supposed excreta of the adult flea) that had been left with the nits, etc., on a cloth by a sleeping dog. They were suspected, however, of cannibalism, as their numbers thinned with no other apparent cause. On October 25, the seventh day after leaving the egg cases, the surviving individuals were found curling up and otherwise acting as though about to pupate. Upon noticing this they were supplied with a fragment of "puttoo," into which, though eyeless, the larvæ quickly swarmed, and there spun little white silken cocoons. November 2, most of them quitted their cocoons as perfect, active fleas. They were, therefore, in the eggs for something over two days, as larvæ for six days, and pupæ for eight days, attaining their adult state on the seventeenth day after the deposition of the eggs. This is a much shorter period than given by older writers—Westwood, followed by Packard—who affirm that fleas are larvæ for twelve and pupæ for eleven to sixteen days. However, this may in part be due to the warmer climate of India, where the observations just detailed were made. —*Insect Life.*

AN IMPROVED BAGGAGE CHECK.

The illustration represents an excess-baggage tag which has been patented by Mr. Frank H. Crump, of No. 1300 Pennsylvania Avenue, Washington, D. C. This invention relates mainly to the upper section of a tag ordinarily printed in one piece, on which are also the agent's stub and the passenger's stub, separated by lines of holes to facilitate tearing off. The improvement consists in a tag having a protective flap, beneath which is held a series of similar coupons, each bearing a printed scale of the excess in weight and the date, which may be punched by the agent of the road that receives the trunk, so as to similarly mark with the weight and date each coupon. These coupons are successively torn off by each road



CRUMP'S BAGGAGE CHECK.

over which the trunk passes, and are designed to constitute for each road a basis of settlement with the road first receiving the trunk. To protect the tag it is carried in a metal case formed of a plate having upturned edges and a slot for receiving a strap attached to it, and by which it is attached to a trunk.

AN IMPROVED LIFE RAFT.

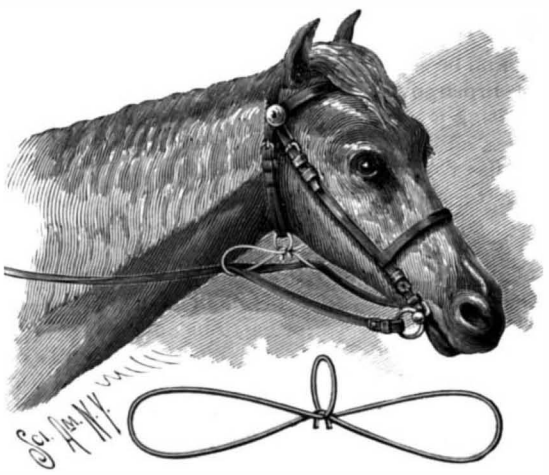
The device shown in the illustration has been patented by Mr. Mills Edwards, of No. 426 Bergen Avenue, Jersey City, N. J. It is a rectangular buoy composed of a canvas covering and a filling of cork or other buoyant material, other similar buoys being fitted between the sides and ends, and the buoys being held between or having lashed on their opposite sides light binder frames of wood. At opposite corners of the main rectangular body is fitted a receptacle for oil,

EDWARDS' LIFE RAFT.

with a pipe through which a person with the breath may force oil in small quantities out upon the water to quiet the waves. At the center of the inner buoys are tanks or receptacles for drinking water, with tubes therefrom for the supply of the occupant of the raft, while at each side of the inner buoys is lashed a pouch in which provisions may be carried. There are ropes at the sides and ends of the raft, and oars are lashed thereto, while at one end is a drag rope and drag by which the raft may be kept up in the wind and kept steady in rough weather.

AN IMPROVED REIN GUIDE.

The device shown herewith is designed to guide and support the reins so that they will not be liable to en-



STOAKES & FRITH'S REIN GUIDE.

tanglement with the thills or shafts, and has been patented by Messrs. James W. Stoakes and Thomas F. Frith, of Milan, Ohio. It is made, as shown in the small view, of a single piece of spring wire bent upon itself to form two end loops, through which the reins pass, and a central ring, by which it is suspended from the throat latch of the bridle. The device readily swings into position to allow the reins to be manipulated as desired, without their bearing to any appreciable extent upon it, but when the reins are slack they are held up from being swung by the horse under the ends of the shafts.

WE are accustomed to be told that the most impure water will be rendered pure by boiling, and that in this we have an absolute safeguard against the danger of water containing disease germs. Now while it is true that boiling will kill the germs of disease, yet the fact has been brought to our notice, says *Annals of Hygiene*, by so high an authority as Dr. Chas. M. Cresson, that while boiling kills the germs of a particular disease, it yet, in reality, renders the water more impure than it was before, because by the very death of these germs, dead organic matter is allowed to remain in the water, which is polluted by putrefaction. Hence, while boiling is a most excellent precaution against the occurrence of typhoid fever or similar diseases, when we have occasion to think that the germs of these diseases exist in the water that we drink, yet we must remember that this boiling does not purify the water; it simply removes from it the specific power to produce a specific disease.

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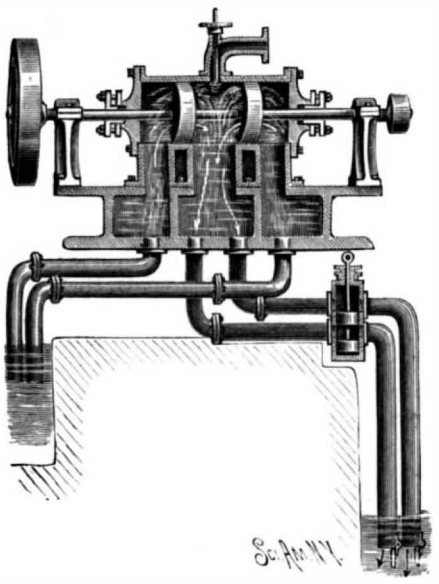
AN IMPROVED HYDRAULIC MOTOR.

The motor shown in the cut, patented by Mr. Hans P. Christiansen, utilizes in its operation the principle of a siphon, the valve and pipe shown at the top affording ready means of always keeping the siphon perfect, water being there admitted to fill all the pipes before the motor commences to work. The level of the water, as shown at the left in the illustration, being higher than at the right, the current flows from the left, as shown by the arrows, through the pipes to both ends of the main cylinder. The driving shaft passes centrally through this cylinder, and on it are mounted two turbine wheels, the wings of which are inclined in opposite directions. The wheels divide the interior of the cylinder into three compartments, both of the end compartments receiving a flow of water from the higher level, which, after passing through the wheels, and exerting its force upon the driving shaft, passes out of the central compartment and thence to the lower level. In the horizontal part of the pipes leading to the lower level is arranged a valve casing with valves by means of which the operator can at any time stop or start the motor, in ordinary operation, by simply closing or opening the valves.

For further information relative to this invention

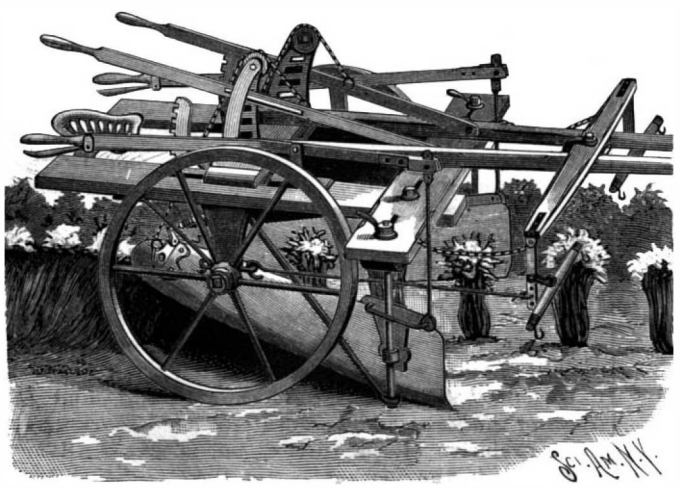


CHRISTIANSEN'S HYDRAULIC MOTOR.

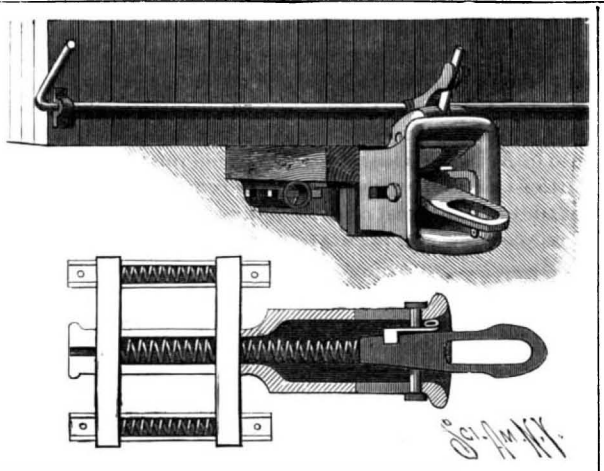
address Messrs. Jens Hansen & Co., No. 463 B Street, Oakland, Cal.

AN IMPROVED MACHINE FOR HILLING CELERY.

In the machine shown in the illustration the mold-boards are adjustable to suit the height of the plants, and laterally to correspond with the width of the rows, the machine being designed to crowd the earth from the bottom of the furrows under the leaves simultaneously upon both sides of the rows. It has been patented by Mr. Maurice M. Ranney, of Comstock, Mich. The side beams of the frame are adjustable laterally upon the cross beams, and from the under side of each side beam projects a pedestal with an attached spud axle upon which the drive wheels revolve. A post extends downwardly, from a bracket on the under side of each side beam, through a staple and eye formed on a plate attached to the forward end of the mold-board, each post being stayed by a brace bar, and the eyes and staples being large enough to move freely upon the post. For the vertical adjustment of the mold-boards, a link connects the staple on the forward end of each with the forward end of a lever fulcrumed upon an upright of the frame, a rack secured to one of the side beams being provided for each lever, which extends to within easy reach of the driver. A stirrup is bolted upon the outer face of each mold-board at its rear end, a chain from each stirrup passing over a friction pulley journaled on the upper end of a rack secured to the center cross beam, to attachment with a lever pivoted on the forward cross beam, and extending to the driver. The mold-boards are so hung that they



RANNEY'S MACHINE FOR HILLING CELERY.

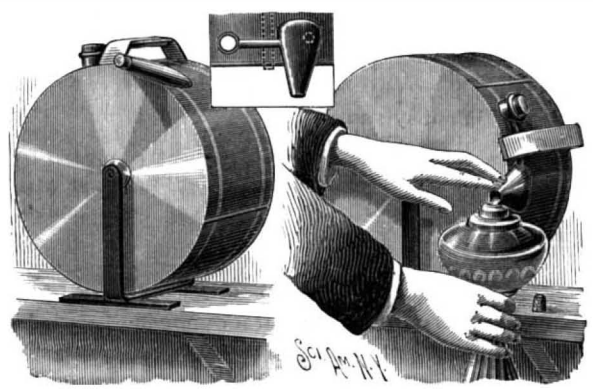


McKERAHAN'S CAR COUPLING.

are quite a distance apart at their forward ends, and nearer together at the rear, where the two boards are connected by a spiral spring, which spring is attached through short adjustable arms, whereby the spring may be lengthened when it is desired to only half hill the rows. The driver, by resting his feet in the stirrups of the mold-boards, can adapt them to any crookedness of the rows or irregularities of the surface, the machine being adjustable to rows from three to five feet apart and from six inches to two and a half feet in height.

AN IMPROVED LIQUID HOLDING VESSEL.

The accompanying illustration represents a vessel to hold oil or other liquids, and permit the contents to be readily and safely decanted into a lamp or other vessel with a small opening, the receptacle being also adapted to hold liquids for transportation or storage. This invention has been patented by Mr. Stewart R. Mace, of Moulton, Iowa. The holder consists of a horizontal cylinder pivotally supported in a suitable stand, the points of pivotal support of the vessel being above its axial center, whereby the weight of contained liquid will always retain the vessel in such position that the filler nozzle and discharge spout will be at the top, except when the vessel is turned in its journaled supports to discharge its contents. The filler nozzle projects from the cylindrical wall of the vessel on one side of the handle, and on the opposite side is the discharge spout, a small orifice from the interior opening into the inner lower portion of the spout, the opening from the interior being considerably less than the outer opening of the spout, so that there will always be an air space above the escaping stream. Intersecting the rear portion of the spout, above the wall of the vessel, is a transverse air passage, produced by the attachment of an arched piece of sheet metal, as shown in the small

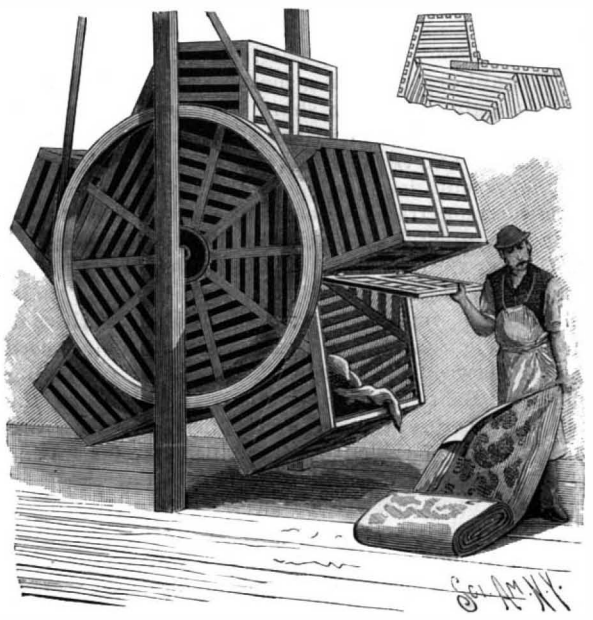


MACE'S LIQUID HOLDING VESSEL.

view, this air passage being in open communication with the vessel near the filler nozzle, so that there is a continuous air duct which will only be closed by the insertion of a stopper or cork in the outer end of the discharge spout. As a consequence the stream of oil or other liquid is caused to flow smoothly, and the spout is designed to be entirely free from drip.

AN IMPROVED CAR COUPLING.

The coupling shown in the illustration is designed to be automatic in its operation, and to permit the disconnection of the coupling from either side of the car, while it also possesses a longitudinally yielding link bar whereby injurious shock is avoided. It has been patented by Mr. Charles McKerahan, of No. 78 Middle Street, Alleghany City, Pa. The drawhead has a rearwardly extending portion of reduced diameter, and the front part of its top wall has a hollow projection or pocket that is longitudinally slotted to permit the vibration of an upright lever. The link bar is pivoted on pins in opposite longitudinal slots in the throat of the drawhead, thus adapting it to be inclined from a horizontal plane and have a sliding movement, and at its rear end is a stout spiral spring extending within the reduced rear portion of the drawhead body, as shown in the sectional plan view. At the side of this spring are two longitudinally slotted spring cases, each containing a spiral spring, the flat transverse guide bars of which extend through the intermediate slotted rear end portion of the drawhead body, the spring cases being secured upon stringers of the car frame. A heavy depending latch block, adapted to engage the opening in the link bar, is pivoted to swing in the pocket in the top wall of the flaring portion of the drawhead, and at its side is a spring dog adapted to maintain the latch block in normal position for coupling when the parts have been arranged therefor. The lower end of the upright lever in the slot in the top of the drawhead is secured to the latch block, its upper end being engaged by a rock arm upon a transverse shaft journaled in boxes attached to the end wall of the car body, this transverse shaft being rotated by crank arms at the sides of the car. A flat loop, its ends made fast to the car frame, engages the sides and bottom of the drawhead to hold it from displacement and allow it to slide longitudinally. When two cars having this coupling are to be connected, the latch blocks are raised, when, upon engagement of the link



BOWMAN'S CARPET CLEANING MACHINE.

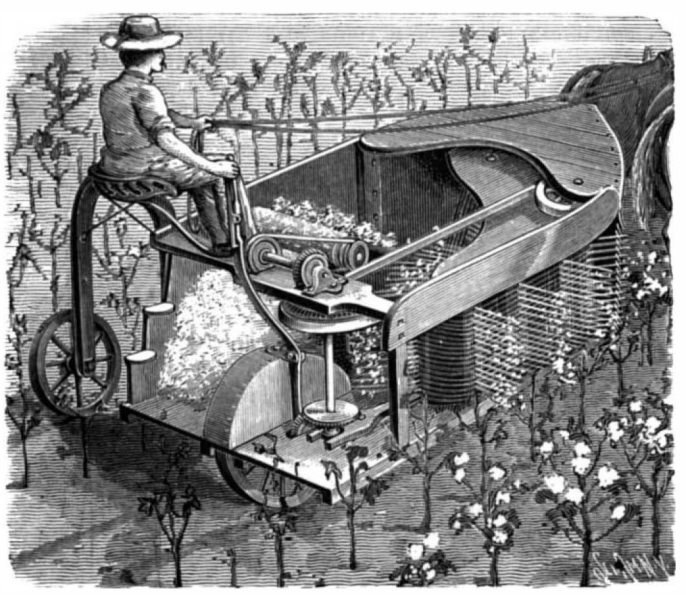
bars by the coming together of the cars, one bar slides above the other, and the top bar, by its contact with the spring dog, lets the latch block fall into locked engagement with the link bar that is on top, thus effecting a secure coupling, and one which permits of free lateral motion.

AN IMPROVED CARPET CLEANING MACHINE.

The cut shows a rotary machine designed to prevent the bunching of the carpets being cleaned in it, which forms the subject of a patent issued to Mr. William Bowman, of Battle Creek, Mich. The hub of the machine has two classes of radially extending spokes, one class of spokes extending outward to tangentially arranged strips which constitute retainers, while the others lead to tangential strips connected to the retainers. Upon the retainers and the strips are built up frameworks serving as supports for slats, whereby there are formed outer carpet-receiving chambers, while to the spokes are connected strips which act as barriers at the ends of the machine. One or more traps or lids are provided, for putting in and taking out the carpets, which, as the cleaner is revolved, fall from the upper chambers into the lower chambers, and thus are thoroughly beaten.

AN IMPROVED COTTON PICKER.

The illustration represents a machine designed to pick only the ripe cotton, without disturbing the bolls



STEPHENSON'S COTTON PICKER.

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of unripe cotton or the leaves or limbs of the plant. It has been patented by Mr. Charles R. Stephenson, of Lyon, Miss. In the forward part of the car which carries the mechanism, at one side, is journaled a vertical shaft, upon which is loosely mounted a frame, the top and bottom faces of which are nearly triangular in general outline, these faces being connected by vertical strips. On the vertical shaft, within the frame, is a drum, and in the rearwardly extending portion of the frame is another shaft carrying a drum, an endless apron extending around the two drums. Upon this apron are vertical boxes in which are journaled outwardly projecting spindles that are tapered and have longitudinal grooves. Upon the inner ends of these spindles, within the boxes, are grooved pulleys, the upper pulley having a flange adapted to roll in contact with a track attached to the under surface of the upper part of the frame, and thus communicate a rotary or twisting motion to all the pulleys and their spindles, by means of a belt or cord running over the top and bottom pulleys and alternately behind and outside of the others in the series. A vertical shaft, journaled in the floor and a rear cross bar of the frame, receives its motion through bevel gears from the drive wheel, a clutch mechanism, connected with a lever in easy reach of the driver, allowing the gear to be thrown into and out of engagement, and a belt from this shaft operates the forward drum-carrying shaft. Upon the lower end of this main operating shaft is formed an eccentric adapted to be engaged by the short arm of a forked lever pivoted on the floor in front of it, the long arm of such lever entering a notch in the lower part of the drum-carrying frame, whereby the latter is vibrated, or moved in and out, with the rotation of the shaft. In the forward part of the frame, to the left of the drum shaft, is also journaled a vertical drum shaft, belts or cords running horizontally around all three of the shafts journaled in the frame, one such belt or cord passing between each series of outwardly projecting spindles. Behind the latter shaft, and adjoining the wall of the car, is arranged an inclined endless carrier, the lower end of which is placed near the floor while its upper end is near the top of the car at the rear, the drum operating the carrier receiving its motion through a belt from a short shaft connected with the main operating shaft. The upper part of the main drive wheel is incased, and the auxiliary side wheel turns on a stud projecting from an inverted U-shaped bar attached to the side of the car. As the machine is drawn through the cotton field, the drum shafts are revolved to move the spindles rearwardly, while the cotton is wound loosely upon the rotating spindles, as the vibrating frame is alternately projected among and withdrawn from the cotton plants. As the spindles pass into the car at the rear, the cotton is removed from them by the horizontal belts or cords passing around the drum at the foot of the inclined carrier, which takes the cotton up for delivery in bags or to a wagon attending the pickers.

Rich without Money.

Many a man is rich without money. Thousands of men with nothing in their pockets, and thousands without even a pocket, are rich. A man born with a good, sound constitution, a good stomach, a good heart, and good limbs and a pretty good headpiece, is rich. Good bones are better than gold; tough muscles than silver; and nerves that flash fire and carry energy to every function are better than houses and land. It is better than a landed estate to have the right kind of a father and mother. Good breeds and bad breeds exist among men as really as among herds and horses. Education may do much to check evil tendencies or to develop good ones; but it is a great thing to inherit the right proportion of faculties to start with. The man is rich who has a good disposition, who is naturally kind, patient, cheerful, hopeful, and who has a flavor of wit and fun in his composition.

The hardest thing to get on with in this life is a man's own self. A cross, selfish fellow, a desponding and complaining fellow, a timid and care-burdened man—these are all born deformed on the inside. They do not limp, but their thoughts sometimes do.—*Clay Manufacturers' Engineer.*

The Swedish Cure for Drunkenness.

The habitual drunkard in Norway or Sweden renders himself liable to imprisonment for his love of strong drink, and during his incarceration he is required to submit to a plan of treatment for the cure of his failing which is said to produce marvelous results. The plan consists in making the delinquent subsist entirely on bread and wine. The bread is steeped in a bowl of wine for an hour or more before the meal is served. The first day the habitual toper takes his food in this shape without repugnance; the second day he finds it less agreeable to his palate; finally he positively loathes the sight of it. Experience shows that a period of from eight to ten days of this regimen is generally more than sufficient to make a man evince the greatest aversion to anything in the shape of wine. Many men after their incarceration become total abstainers.

THE DEVELOPMENT OF THE CALIPER.

One of the first tools to suggest itself to the mind of the early worker in metals for the measurement of diameters or thicknesses probably was a gauge something like that shown in Fig. 1, which is simply a notched plate of iron, the width of the notch being the measurement of the diameter or thickness required, and by repeated applications of this gauge to the work, as it neared completion, accurate results were secured; but

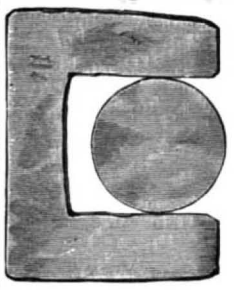


Fig. 1.

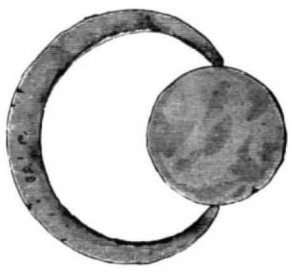


Fig. 2.

this tool was what would now be called a special tool or gauge designed for measuring fixed diameters. It lacked the adjustable feature which was necessary to adapt it to work of different sizes. Of course the tool could have been heated and altered, but this would have occasioned considerable labor, as well as the loss of the original gauge. It is, therefore, probable that, for an adjustable gauge or caliper, something like that shown in Fig. 2 was employed.

This tool consisted of a curved bar of metal, with the ends approaching each other, and the adjustments were effected by bending the bar. An obvious and early improvement upon this caliper is shown in Fig. 3. The difficulty of bending a bar whenever an adjustment was required suggested the use of a frictional joint at the center of the bar, which would permit of swinging the arm of the caliper to adapt it to the measurement of different diameters. From this crude mechanical device have been developed all the modern improved forms of caliper, one of

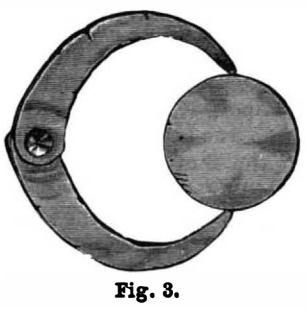


Fig. 3.

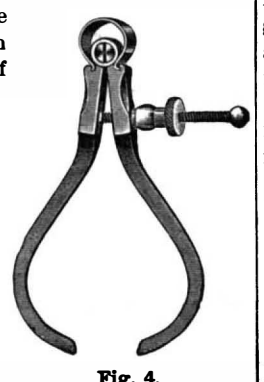
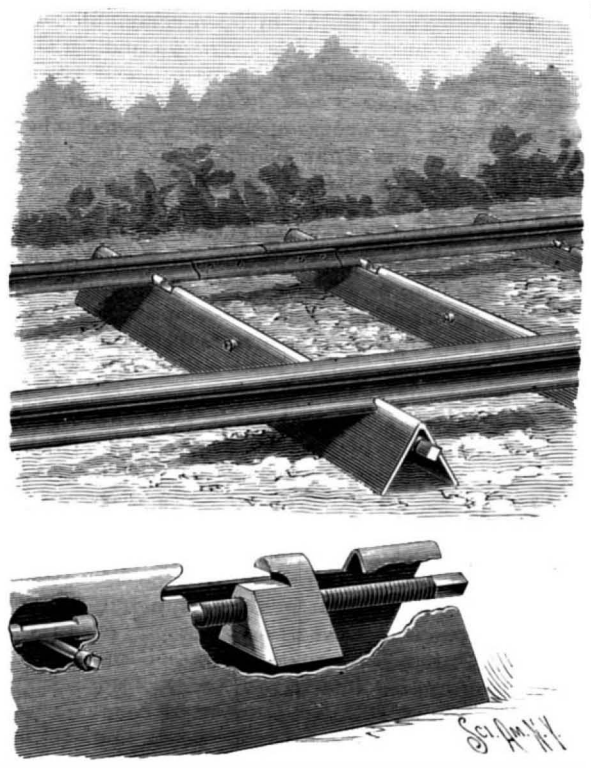


Fig. 4.

the latest improvements in this line being what is known as the Stevens caliper, represented in Fig. 4, manufactured by the J. Stevens Arms and Tool Co., Chicopee Falls, Mass. In this caliper the jaws are connected together by a fine joint, and a C-shaped spring is applied which tends to separate the free ends of the jaws. The adjustment is instantly effected by a simple and durable slip nut, which, together with the joint and spring, forms an ideal arrangement appreciated by every mechanic.

AN IMPROVED METAL CROSS TIE.

The cross tie shown in the cut is designed to securely hold the rails in position and be sufficiently elastic to prevent injurious shocks to the rolling stock. It has been patented by Mr. James P. Taylor, of No. 315 Pecan Street, Fort Worth, Texas. The body of the tie is preferably of wrought iron plate, and bent to nearly triangular shape in cross section. At the proper distances apart to allow for the width of the track are longitudinal slots, in which are integral lips or flanges adapted to hook over the adjacent edge of the base flange of the rail when placed on the tie. Within the tie body is located a rod, oppositely threaded at each end, and on these threads are mounted blocks or nuts, as shown in the small figure, each block having a lug adapted to fit upon the inner base flange of the track rail. The outer ends of the rod are squared to receive a wrench, and near its center is a square portion, where the rod rests upon a transverse bolt. The squared portion of the rod is designed to retain it from rotation when in place sufficiently to prevent it from relaxing the lugs, the rod yielding when turned by a wrench to adjust the parts and draw these lugs against the flanges on the track rails.



TAYLOR'S METAL CROSS TIE FOR RAILROADS.

Thinking and Doing.

The successful man, as a rule, is that one who knows the trick of doing the right thing at the right time, and the trick is not one which comes from inspiration, but from trained habits and thought. All the untrained genius in the world combined could not have composed in their present perfect literary form the thirty-nine articles, it was genius schooled and trained which accomplished them.

Attention enough is now given to physical training, but there is still a somewhat common lack of faith in some parts of the United States with regard to the advantages of mental training. A little "schooling," it is considered, is essential, but boys and girls, it is thought, especially in the country, should not be permitted to waste too much time over their books. The theory was, and, to a lesser degree, is, that good men are best made by beginning their working careers early—the earlier the better. But a change is occurring in this matter, as in others, and in these days of great enterprises, in which trained thought, science, and skill play so large a part, the man of educated mind is likely to be preferred to the man of uneducated mind. The man who has been taught to think according to system and principle is the man who, in the most attractive business pursuits, is sought by employers.

The value of such training as enables the man to rise promptly to the requirements of the emergency was very happily illustrated by Mr. Chauncey M. Depew the other day in an address he delivered to the boys of St. Paul's school, at Concord. Mr. Depew said:

"In a boat race between a Yale and an outside crew the other day, the oar of the stroke oarsman broke just at the critical moment. In such cases the great thing is to know just what to do, to be able to call on all your powers of knowledge and skill. The ordinary man knows how to drive, to go to church and sit in his pew, to come in when it rains, but only the well trained man knows what and how to do in an emergency. An ordinary man would have said: 'Abandon the race.' This fellow made up his mind in a moment, and judging just the right moment and just the right place, he leaped from that thin shell of a boat without disturbing the other rowers. Thus the boat was relieved of his weight, and Yale won."

The difference between the ordinary and the extraordinary man, when it does not arise from extraordinary natural gifts, to quote from the Philadelphia *Ledger*, lies generally in the superior mental training of the latter. The former may have intellect as quick and bright, but unless it has been trained to act, he is like a man with all the craftsman's tools, but without the craftsman's trained skill. The hand does the better work always, the better-schooled the thought behind it is, and this applies not less to the ordinary workman of the anvil, saw, or loom than to the man of affairs. The carpenter or mason whose mind has been trained as well as his hand is likely to put aside the plane and the trowel and to become the master builder or architect. It is the mental training that tells oftenest in this world's race, and the man who seizes the right moment in it when to stay in or when to leap from the boat is pretty certain to be found at the end upon the winning side.

The Tortoise Market of Philadelphia.

The taste for "stewed terrapin" and "snapper soup" has become so general in Philadelphia, that the United States are now ransacked for the means of supplying it. Within a few years the species sold were the "terrapin," *Malacoclemmys palustris;* the "red belly," *Chelopus insculptus;* the "slider," *Chrysemys rugosa;* and the "snapper," *Chelydra serpentina.* Now large invoices of turtles are sent from Mobile, New Orleans, and St. Louis, which include the following species: *Chrysemys bellii, C. elegans, C. concinna,* and *C. troostii; Malacoclemmys geographica,* and *M. leseurii;* total, exclusive of sea turtles, ten species. All are abundant in the market except the *C. bellii.*—*E. D. Cope.*

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Natural History Notes.

The Lamp Bird.—An explorer, Dr. H. Labonne, mentions a curious peculiarity of the stormy petrel, which has caused it to be styled the lamp bird by the fishermen of the island of Saint Kilda. The flesh of this bird is very oily, and the inhabitants of the island, who kill it by thousands, utilize this property for domestic purposes. They insert a wick in the bird's bill, and obtain for an hour a light that is sufficiently bright to serve their purposes.

Conversion of Sugar into Starch by Plants.—According to the researches of Saposchnikoff, sugar can be turned into starch in the leaves of plants. Plants of various kinds were placed by him in the dark for a time, and then some of the leaves were cut off and divided in halves along the midrib. One half was tested for starch, and the other was allowed to remain for from four to ten days in a 10 to 20 per cent solution of cane sugar, and then tested for starch. The latter was found in abundance, especially along the veins. In variegated leaves, only the chlorophyl cells formed starch.

The Forms of Leaves.—Two papers relating to the forms of leaves were recently read by Sir John Lubbock before the Linnean Society. The first paper dealt with the form of the oak leaf, which is unequally developed on the two sides of the midrib, and sinuate at the margin. He compared this leaf with that of the beech, and showed that the leaf bud is smaller in the oak than in the beech, although the leaf is larger. For this reason the oak leaf becomes curved in the bud, and this curvature is probably the reason of the sinuate form of the leaf. The asymmetrical form is due to the leaf being conduplicate, so that one half of the leaf is subject to less pressure than the other during growth. In the beech, the leaf not being subject to the same pressure in the bud, it is not curved, and the development of the parenchyma takes place in the form of plaits. The second paper related to the two British species of *Viburnum*, in which, although the two species sometimes grow within a few yards of each other, the form and character of the leaf is quite different. In *Viburnum lantana* the leaves are densely hairy when young, and are not lobed. In *V. opulus* the leaves have stipuliform appendages and the leaves are lobed and glabrous. In all the species allied to *V. opulus* the leaves are lobed and these appendages are present. In *V. lantana* the hairy surface serves as a protection to the young leaves, but in *V. opulus* the young leaves are protected by thickened scales. The pressure thus exerted throws the leaf into the lobed form, and the stipules fill the hollow left at the base of each folded leaf, just as in the maples, which have leaves similar in shape. The interstices are filled up by the smaller succeeding pair of leaves.

Effect of Light upon Plants—From some experiments by Mr. W. G. Smith, it seems that the plant commonly called the strawberry geranium (*Saxifraga sarruentosa*) well serves, when grown with light on one side only, to show heliotropism and negative heliotropism. A small plant placed in a window turned all its leaves to the light, but sent out seven stolons away in a straight line from the light. As these elongated they became pendulous and formed rosettes of leaves at their tips. The new leaves requiring light, the stolons altered their direction and grew toward the light, until the young plants almost touched the glass. These young plants also sent out stolons, which again grew away from the light, and the same thing happened with a third generation of stolons.

Migrations of Plants as Affecting those of Insects.—A correspondent of *Insect Life* says that when he first went to Kansas, eighteen years ago, two plants were unknown in Geary County which are now very abundant. One of these is the *Solanum rostratum*. The region for two or three years suffered from the ravages of the Colorado potato beetle, but now, though the beetle is sufficiently abundant every year, the potatoes rarely are damaged. The cause seems to be that *Solanum rostratum*, sometimes called Buffalo nettle, or Buffalo thistle, is the native food plant of this beetle, and where it is scarce *Solanum tuberosum* is accepted as a substitute. The plant belongs to regions farther west, and by some means the beetle traveled in abundance eastward, reaching the other side of the Atlantic years ago, where the plant is still unknown. It is said that the prickly seed pods of this plant came on the tails of Texas and other cattle from the Southwest, and it is certain that counties remote from the cattle trails and the through lines of railway were the last to have the plant. The flower is bright yellow, and the whole plant not unhandsome, but its prickles make it a very undesirable weed. Two years ago the writer took particular pains to eradicate it in and around his garden patch, killing every young plant of *S. rostratum* as it came up. The result was a serious attack on the potatoes, which were only saved by twice going over all the plants and collecting and destroying the beetles. That the plant did not migrate easterly at a greater speed is to be wondered at, as in the region of the one hundred and second meridian on the wide prairies, it has the tumble weed habit. The whole plant is subglobose, and when ripe snaps off close to the ground and goes bowling along before the wind at a great rate. The winds there, however, are more north and south than from the west, so that probably has delayed the progress of the plant in longitude. The plant is abundant in waste places in towns, and by roadsides in all eastern Kansas now, and we rarely hear of the Colorado beetle damaging potatoes.

Effect of Poison on Sponges.—The *Biologisches Centralblatt* for April 1 contains a paper by Mr. Ledenfeld on the action of various nerve poisons on sponges. He finds that curare, strychnine, and cocaine act on living sponges in much the same way as on higher animals, curare relaxing the sphincter muscles surrounding the pores in the external surface, strychnine causing a sharp contraction, and cocaine rendering them less sensible to irritants. He believes, therefore, that the cells which act as muscles are in relation with others that act as sensory nerves, which are in the first place affected and communicate their irritability to the muscle cells.

Animal Coloring Matter.—In the *Journal of Marine Biology*, Mr. C. A. McMunn briefly discusses the coloring matter of several invertebrates. Among the interesting facts are these: Spectroscopic examination fails to show the presence of symbiotic algæ in *Antedon*, it being found that contrary results were due to the presence of plants in the food, and that when the stomach was removed, neither chlorophyl nor chlorofucin occurred in the extract. The digestive glands of echinoderms and crustacea not only form digestive ferments, but exercise a chromatogenic function. Chlorophyl was found in several annelids, while other green worms possessed no chlorophyl. The lipochromes in some cases may act as an absorber of light rays, but its other function is very uncertain. The author shows that a knowledge of invertebrate coloring matter is absolutely essential to a clear understanding of the physiological action of the pigments of the vertebrata.

Absorption of Nitrogen by Plants.—Since the apparently conclusive experiments of Boussingault, which were completed as long ago as 1854, it has been accepted as an axiom in physiological botany that the free nitrogen of the atmosphere is useless to plants for the purpose of assimilation, and that the exclusive source of their nitrogenous compounds is the soluble nitrates in the soil. But like so many generally accepted beliefs, very grave doubt is now thrown on the correctness of this view by several papers in the "Landwirthschaftliche Jahrbucher," by Dr. B. Frank. In these papers the results are given of a series of experiments which he considers to prove the point that the amount of nitrogen in the tissues of the plant is in excess of that which could possibly be due to the soluble nitrates absorbed from the soil. The nitrogen, which must thus have been absorbed through the leaves directly from the atmosphere, is perhaps in the tissues in the form of organic nitrogenous compounds, not of nitrates. The nitrates present in the tissues of plants, the amount of which varies greatly with different plants, are entirely absorbed as such through the roots. Dr. Frank believes that the low forms of vegetable life, as *Oscillaria*, *Ulothrix*, *Pleurococcus*, *Chlorococcum*, and the protonemes of mosses, have especially this power of removing free nitrogen from the atmosphere, and forming therefrom nitrogenous compounds, but that the property is probably common to all vegetable organisms which contain chlorophyl, and that, like the assimilation of carbon, it is a function of their chlorophyl. Drs. Hellriegel and Willfarth have put forward another view—that there is an essential difference between the way in which Leguminosæ obtain their nitrogen, and that of other plants. They claim to have determined by experiment that the growth of barley and oats is in direct proportion to the amount of nitrates absorbed from the soil, and that they are totally unable to live in a soil entirely deprived of nitrates. This is not the case, on the other hand, with vetches, which may grow luxuriantly in a soil containing no nitrogen, and which must, therefore, obtain their nutriment from some other source, viz., the free nitrogen of the atmosphere. The authors advance the theory that they do not do this directly, but through the instrumentality of the microbes contained in the tubers which occur on the roots of the vetch, bean, and many other plants belonging to the Leguminosæ. These microbes, therefore, carry on a symbiotic existence with the host plant, the microbes contained in the soil not being available for this purpose.

To this Dr. Frank replies, dissenting from the distinction drawn by Hellriegel and Willfarth between Leguminosæ on the one hand and grasses and other orders of plants on the other hand, all of which, he maintains, are, in certain conditions, capable of assimilating directly the free nitrogen of the air. He further points out that there is no single direct observation to connect the "bacteroids" in the root tubers of Leguminosæ with this supposed function, that the fact of their being living organisms is subject to considerable doubt, and that their structure and mode of life are altogether different from those of "mycorhiza," in which a true symbiosis between the fungus and the root which it envelops has been satisfactorily demonstrated.

Size of House Sewers.

As controversies occasionally arise between architects or owners and the health authorities as to the size necessary to the main house drain and sewer, it has been thought worth while to give somewhat in detail the data upon which the regulations of the New York Board of Health are based.

About a year ago the health department found that, in several cases, house sewers of the size which they considered essential for large buildings were not permitted by the co-ordinate department which has in charge the public sewer system. Correspondence followed as to the desirability of reaching a mutual and satisfactory understanding. This resulted in the preparation of a report on the subject by Messrs. Rudolph Hering and Horace Loomis, respectively engineer in charge of sewers and consulting engineer of the department of public works. This was accepted by the board, and its conclusions made the basis of their future requirements. The main points of the report on the deductions are as follows:

The first consideration is evidently as to the amount of water, per unit of surface, for which provision must be made. Formerly the records kept of rain storms gave merely the total fall per hour, leaving it uncertain whether this was uniform or, as more generally the case, the greater part had fallen in a comparatively short time. However, the meteorological observatory has obtained for a number of years an automatic record of the rainfall, showing for each storm the maximum rate and its duration, which evidently gives the data required for determining the size of the drains. These records show that, during the eight years from 1880 to 1887 inclusive, there were in all thirty storms with rates greater than one inch per hour:

Number of Storms.	Rate. Inches per hour.	Duration in minutes.
12	1 to 2	20 to 60
7	2 to 3	10 to 30
4	3 to 4	8 to 15
1	4 to 5	15
3	5 to 6	5
2	6 to 7	3 to 10
1	7·5	2

Thus in the eight years covered by the records there have been three storms with a rainfall of the rate of more than six inches per hour, lasting from two to ten minutes. As a very few moments of such a storm would wet and cool a roof or paved surface sufficiently to check evaporation, nearly the whole amount of water must have reached the house drain. It was therefore considered wise to provide for a maximum fall of six inches per hour, as the damage inflicted by a single storm, when the drains were insufficient, would more than outweigh the additional cost of the larger pipe. At the same time the other and equally important fact was kept in view that the drain should be made, as far as practicable, self-scouring under the ordinary conditions, and to accomplish this the diameter should be kept as small as may be consistent with safety.

The second consideration in determining the requisite size of the drain is the velocity of the water in the pipe. This should evidently be, not that derived from a theoretic equation, but such as can be attained in practice after making all due allowances for traps, short bends, etc. It was thought doubtful whether a velocity of six, or even five, feet per second could be obtained through a six inch quarter bend, unless the pipe was discharging full and under pressure. A maximum velocity of four feet was therefore assumed as safe.

Again, to prevent the drain running quite full, an available sectional area of 0·18 square foot was assumed for the six inch pipe. This, with a four foot velocity, would give a capacity of 0·72 cubic foot per second. With a six inch rainfall per hour, one square foot of roof surface would receive about 0 000140 cubic foot of water per second. The six inch drain should therefore carry the water from about 5,000 square feet of surface, if it have an effective grade of one-quarter inch per foot.

With a grade of one-half inch per foot, which is often practicable, and a fairly straight run of pipe, the velocity may be raised to six feet per second, and therefore the capacity and amount of surface drained increased to one-half. In this case the six inch sewer would safely carry the storm water from 7,500 square feet of roof. The following table gives the size of pipes, with the corresponding area of roof drained when the effective fall is respectively one quarter and one-half inch per foot.

Diameter of Drain.	Roof Area Drained. ¼ Inch Fall.	½ Inch Fall.
6 inches.	5,000 square feet.	7,500 square feet.
7 "	6,900 "	10,300 "
8 "	9,100 "	13,600 "
9 "	11,600 "	17,400 "

For large areas it is always better to use two or more small sewers rather than a single large one, as under the ordinary conditions of sewage flow the small pipes will be more thoroughly flushed. The effective grade of the house drain should also, for safety, be measured from above the hydraulic grade line of the public sewer, which, in this city, during the heaviest storms, will be at least as high as the arch of the sewer.—*A. H. Napier, in Architecture and Building.*

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SINGER'S GREAT SEWING MACHINE MANUFACTORY AFTER THE FIRE.

We chronicled last month the destruction by fire of the great establishment at Elizabeth, N. J., of the Singer Sewing Machine Company. The ruins presented a remarkable spectacle, that of a great field covered over with a mass of cog wheels, band pulleys, and shafts, bent and distorted into all manner of confused shapes. Our artist has attempted to convey an idea of the scene. It is a difficult subject for the engraver.

Some notion of the large extent of the establishment will be gained when we say that the grounds occupied by the works are 32 acres in extent. The main factory building had a frontage of 230 feet on First Street, with a width of 60 feet. The Trumbull Street annex to this building was 800 feet long and 50 feet wide, the whole being four stories in height. Below this building, on Trumbull Street, were the cabinet and box factories, each 200 feet long and three stories high. On the north side of the grounds, adjoining the Central Railroad, were the forging and foundry buildings, together making one continuous building 1,430 feet in length. The foundry alone has an area of 2½ acres in one open floor, and the total floor area of the works is 18 acres.

All the works were rapidly rebuilt and are already again in full operation.

Previous to the fire about 3,300 persons were employed.

One thousand five hundred sewing machines per day are turned out. They consume a very large amount of raw material, the daily melt of pig iron alone varying from 75 to 80 tons.

About $40,000 in wages is weekly distributed among the employes, the most of whom live in Elizabeth.

The Singer Company have thoroughly systematized the manufacture of sewing machines, introducing and successfully using automatic machinery in every department, and with their large corps of well trained employes, the work in their immense factory goes on with the precision and regularity of clockwork. In the factory everything is scrupulously neat, and every provision is made for the safety, health, and comfort of those who spend their time within its walls.

Through the open portions of the premises are scattered trees, which overshadow well kept lawns, thickly dotted with flowers, and, indeed, the grounds, on which a force of men is kept continually employed, have more the appearance of a park than a factory yard.

SINGER'S SEWING MACHINE MANUFACTORY AFTER THE GREAT FIRE.

The Increase of Special Tools.

The fact that machinery specially designed for performing the work required of it can be used to a far greater extent in railroad shops than formerly supposed is now being recognized by progressive men who are superintending the maintenance of rolling stock. The advantages of special machinery in manufacturing establishments where the products turned out are uniform in quantity, size, and design, have long been acknowledged. In such cases the work can be outlined with great exactness, and when it is decided that a certain step in the process of manufacture requires a special tool, one can be supplied which will do the work with economy, while the magnitude of the business will generally keep a machine of this kind continually employed on the work it was intended to perform. In recent years it is, therefore, not uncommon to see shops in which two-thirds of the machinery is either special or fitted with special attachments.

The nature of the work done in the average railway repair shop is in such sharp contrast with that just outlined that it is no matter of surprise to find comparatively little special machinery in them; for while it is quite evident that the manner in which certain work is performed can be improved upon, one may not be justified in obtaining the tool required because it cannot be employed steadily enough to make it pay for the first cost and the floor space which it occupies. This condition of affairs is fast being changed, however, partly from the fact that there is a decided increase in the number of tools which, while deserving the name special, have a sufficient range to permit of their constant employment to good advantage. Another thing which has its influence in bringing about a change is the tendency to do a large amount of heavy repairs and new building at one or two points on a system and have the smaller shops take care of light repairs, these calling upon the main shops for many finished articles. This makes no small portion of the work of the main shops sufficient, both in quantity and quality, to warrant the employment of special tools.

For this special machinery the railroads must generally look to the machine tool builders. The idea may originate with the railroad and the complete design may come from the same source or be the result of the combined efforts of the road and the tool builder, but the road must finally depend upon the builder for the work of construction. With all due credit to the enterprising builders who have done so much to bring forward to their present state of perfection the excellent tools now found in many railroad shops in this country, it must be acknowledged that they do not always act as though they realized the importance of the present tendency toward special machinery in railroad work. We know of cases where they would not undertake the building of a new tool of special character without charging the cost of all drawings and patterns to the company desiring the first tool of that kind, even though, as in one case, the possibility of selling more machines from the same patterns was evidenced by the fact that a second and independent request was presented for prices on a tool for the same work. To be compelled to pay two prices for a machine worth say $2,000, simply because it was the first one, is rather discouraging to the mechanical department of a progressive road, especially when they can see opportunities for selling quite a number of them, provided the first is a success. It makes them think that the tool builders have in such cases little faith in their own designs, do not realize the importance of the tool, or are not disposed to take any chances whatever.

The tool builders, however, are generally fully alive to their opportunities, and there can be little doubt but that there will be a more extensive adoption of special machinery in the near future, and to the list of those now in use we may expect to find added a number in which much of the work now done by planing will be accomplished by milling operations. At least one of the leading roads of the country is beginning to use special milling tools quite extensively, buying them in large numbers for the equipment of new shops, and introducing them in their older plants. This has been done after a trial which has demonstrated their value. —*The Railway Review.*

One Thousand Sheep Killed in a Railroad Accident.

One of the most disastrous wrecks to the Atlantic and Pacific Railroad occurred Friday evening, May 30, two miles west of its junction with the Santa Fe Railroad. A train of double-decked cars, loaded with some five thousand fine merino mutton sheep, on the way from California to the Chicago market, was wrecked by the breaking of a truck. Every car but two was destroyed and about one thousand sheep killed outright. The Indians of the neighborhood worked all night skinning carcasses. They will have mutton for months to come.

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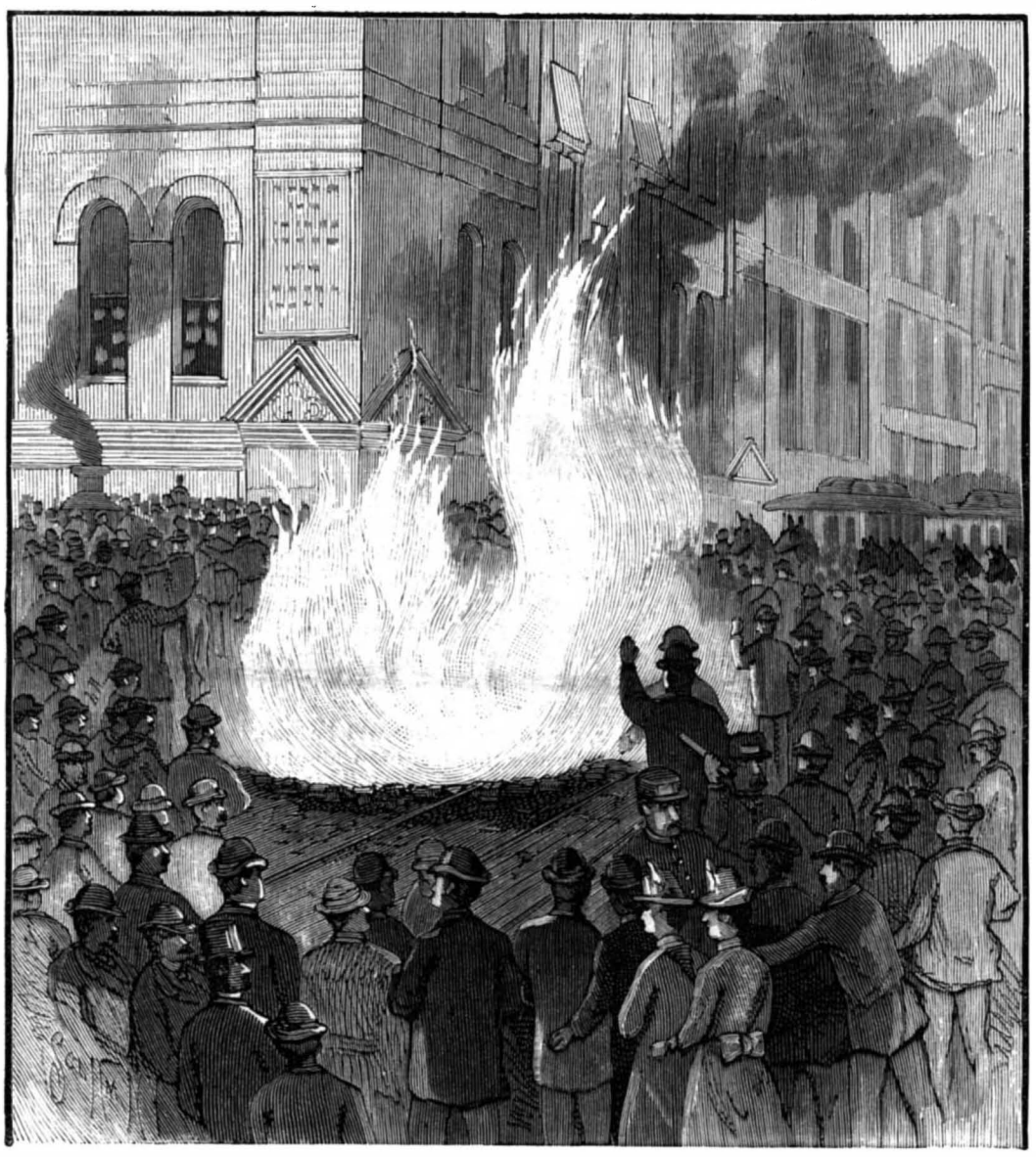
A SUBWAY MANHOLE EXPLOSION FOLLOWED BY A GAS FIRE.

On Friday, June 13, a gas explosion, followed by a conflagration of many hours' duration, took place on the corner of Broadway and Fulton Street, in this city, which is the worst of the many street explosions which have yet occurred here. For a number of days a gang of men in the service of the New York Steam Heating Company had been at work at this locality excavating the street where one of their manholes is situated. The excavation had been pushed to a considerable depth below the lines of water and gas mains, and the workmen early on Friday morning, having finished their work, were filling the excavation. At about 3:30 A. M. a gas explosion occurred. Stones and bricks were sent flying in all directions from the neighborhood of the electric subway manhole across the street. Complaints of gas leakages in the neighborhood have been frequent. After the explosion it was found that there was enough of a leakage to maintain a considerable flame from the neighborhood of the manhole. It seems to have been left to itself, as it continued to burn for some time until it suddenly increased, and for a number of hours a blaze higher than a man was produced, which indicated a consumption of perhaps 5,000 feet an hour. The sudden increase is attributed to the melting of the lead calking of the gas mains. The original cause of the fire is supposed to have been an overturned lamp. One of the workmen is believed to have upset a lamp, which, falling down into the trench, lighted the gas and caused the original explosion.

As the gas companies' representatives reached the scene they commenced bagging the mains in the vicinity. Small holes were made in the pipes and India rubber bags were inserted, which were then expanded by air or by water forced into them. In this way the gas was gradually cut off, and the fire was eventually extinguished.

The damage done to the electric subways and to the wires in them was very great. A quantity of the structure is wrecked. Much of the wire is destroyed, and the loss is placed as high as $70,000. The whole occurrence emphasizes the necessity for some better system of subterranean distribution of light, heat, and electric energy than this city now possesses. The present electric subways with leaky gas mains near them are a constant source of danger. The excavations made by the steam company in the present case undoubtedly disturbed the overlying gas pipes, and caused leaks which were largely responsible for the extent of damage and of risk to life and property.



A GAS FIRE IN NEW YORK.

Uses for Coffee.

It is asserted by men of high professional ability that when the system needs a stimulant, nothing equals a cup of fresh coffee. Those who desire to rescue the drunkard from his cups will find no better substitute for spirits than strong new-made coffee, without milk or sugar. Two ounces of coffee, or one-eighth of a pound, to one pint of boiling water makes a first-class beverage, but the water must be boiling, not merely hot. Bitterness comes from boiling too long. If the coffee required for breakfast be put in a granitized kettle overnight, and a pint of cold water poured over it, it can be heated to just the boiling point, and then set back to prevent further ebullition, when it will be found that while the strength is extracted, its delicate aroma is preserved. As our country consumes nearly ten pounds of coffee per capita, it is a pity not to have it made in the best manner. It is asserted by those who have tried it that malaria and epidemics are avoided by those who drink a cup of hot coffee before venturing into the morning air. Burned on hot coals it is a disinfectant for a sick room. By some of our best physicians it is considered a specific in typhoid fever.—*The Epicure.*

IN a recent speech Congressman Atkinson, of West Virginia, said: "If all the ports of entry on both oceans were to-day blockaded so that no vessel could enter them bearing the products of other countries, and war should be declared against us, we could, with our present facilities, produce every munition of war, and every article that we might need for our sustenance for a thousand years."

Consumption.

We adverted recently to the apparent anomaly that, while it is impossible to trace any direct connection between climatic peculiarities and the prevalence of phthisis, there is a practical unanimity of opinion that no remedy for that disease possesses an efficacy at all comparable to change of residence. A fuller consideration of this paradox will not be without interest and profit. The problem is to account for what we take to be accepted facts—viz., that, on the one hand, phthisis prevails in all countries and in every variety of climate, that St. Petersburg and Naples, Glasgow and Madrid, Bombay and Melbourne, New York and New Orleans, show an approximately similar mortality from this disease; while, on the other hand, all experience proves that change of residence involving change of climate generally effects some good, except in advanced and hopeless cases, and that, after making every deduction for its numerous failures, it remains our most potent therapeutic resource. It was too long the current opinion that when a patient benefited by a sea voyage or a visit to Davos, Colorado, Algeria, or Egypt, it was because he had exchanged a damp climate for a dry one, or a cold for a warm one, and it was somewhat carelessly assumed that the British Islands were hotbeds for the growth of tubercle, and that escape from the British climate was the chief desideratum. A fuller knowledge of the prevalence of phthisis puts an end to such crude notions as these. We know that the disease is excessively prevalent in the large cities alike of temperate, subtropical, and tropical latitudes; that it is as prevalent in the West Indies as in Great Britain, that the West Coast of Africa may compare in this respect with Ireland or Massachusetts, and that, in fact, we get involved in hopeless difficulties when we attempt to trace any regular or direct connection between the meteorological characters of a country and its proneness to tubercle. Yet, withal, it is utterly impossible to question the evidence of the benefit which accrues from a judicious change of climate.

The seeming anomaly begins to become more intelligible if we distinguish between the direct and the indirect effects of climate. Heat and cold, dryness and moisture, have but a slight, if any, effect upon tubercle; but a climate that by reason of sunlessness, variability, cold winds, or other such characters prevents regular outdoor exercise, and depresses the nervous and digestive systems, may be taken as uniformly injurious to the consumptive; while, on the other hand, a climate that, by reason of its high average of cheerful, sunny days, without excessive heat or undue extremes, permits regular outdoor exercises, and acts as a general tonic to the system, may be counted upon with considerable confidence to act beneficially. We think there is strong evidence that no single meteorological feature has any preponderant efficacy, and that we must rather look to the *tout ensemble*, the general features of a climate, and its net influence upon the system. Thus, a climate, advantageous by reason of possessing a high average of bright, sunny days, may be spoiled for the purposes of the phthisical by sudden perturbations of temperature, or by high winds, or by dust storms. On the other hand, equability, which is so desirable, may be purchased too dearly if, as for instance in the Hebrides, it is found in conjunction with almost constant rain and a minimum of sunshine. The sufferer from phthisis requires, speaking broadly, sunshine, fair equability, shelter from much wind, especially from cold winds, facilities for spending the maximum of time out of doors without risk of inflammatory complications, good food, and reasonable comfort. The difficult point is to determine what climate and what locality afford these conditions in conjunction one with the other. Negatively, we may safely lay down the rule that no climate will in the long run benefit if it is sunless or characterized by sudden perturbations of temperature and hygrometric conditions, or if it is very windy, or if its net influence is to encourage an indoor life and habits of invalidism. Our embarrassment in making a choice for an individual case of phthisis arises from the fact that a climate may act beneficially through one of its characteristics and injuriously through another, and the difficulty of striking a balance is often very great. The high altitudes are dry, sunny, and tonic, but the extremes of temperature are great. The interior of some parts of Australia have much to recommend them, but the summer heat is too great, and dust storms are frequent. The ocean islands, such as Madeira or Teneriffe, have much equability and a high average of fine weather, but they often unduly depress the nervous system or upset the digestion. The problem becomes more complicated the more fully it is considered. General rules are of little value, and each case must be considered on its merits and in the light of practical experience.

Change of climate is of value to the phthisical, in the next place, because it usually involves changes of habit. It helps the invalid to shake off his invalidism. It tempts him from his warm corner, easy chair, and self-centered, self-indulgent life, into some participation, however slight, in the interests and pursuits of others. The most signal successes in climatic treatment have been in the cases of patients who have exchanged the invalid's room at home for cattle ranching in Colorado, tobogganing at Davos, *treking* in the Orange Free State, or sheep farming on the Riverine plains or Darling Downs of Australia. Here climate has not been the proximate cause of restoration to health, but it has been the *condition*, without which the other causes could not have come into operation. As a general rule, change of climate without change of life is a failure, and can never be recommended with any degree of confidence. It is to the neglect of this rule that many failures may reasonably be attributed.

Lastly, we cannot afford to ignore a consideration which the modern advances in the pathology of tubercle force upon our attention—viz., that change of climate may often act beneficially by removing the patient from foci of contagion. Even when the disease has become thoroughly developed, it is reasonable to suppose that those conditions which gave it origin may increase its activity.

Change of climate, which a superficial survey of the facts might lead us to regard as likely to be wholly inoperative in phthisis, may in these various ways be theoretically justified, but its chief claim upon our attention is the practical one. It often fails, no doubt, but not seldom it is productive of benefit which we should vainly endeavor to procure by any other means with which we are at present acquainted.—*Lancet.*

I ALWAYS keep ready for use a six ounce bottle of potassa-alum water, made by adding two or three teaspoonfuls of the potassa-alum to the bottle of fresh water. Use equal quantities of this and fresh water for mixing your plaster. It hardens the plaster and keeps it from shrinking, and after vulcanizing, your plaster will not stick to the rubber.—*Dr. Penny, in Archives.*

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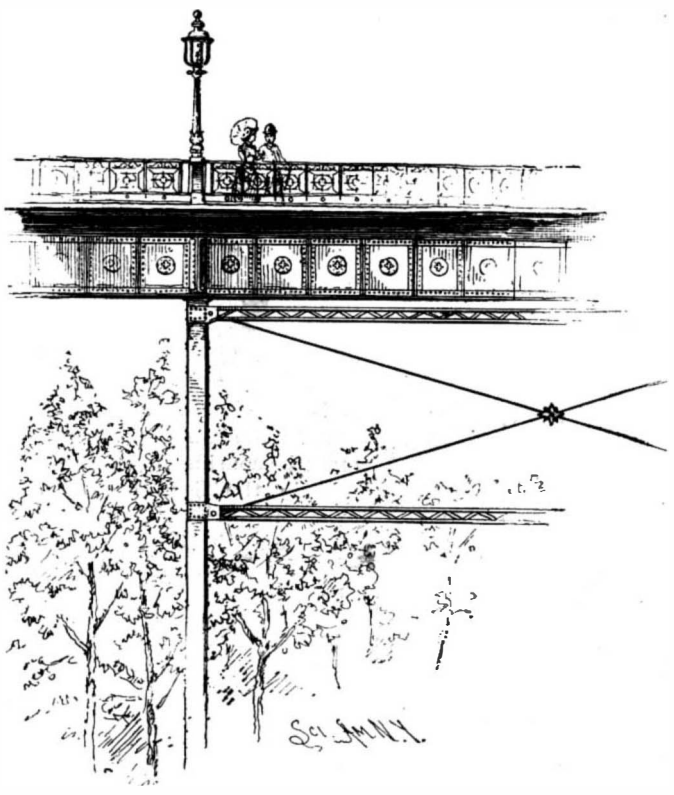
THE 155th STREET VIADUCT, NEW YORK CITY, N. Y.

(*Continued from first page.*)

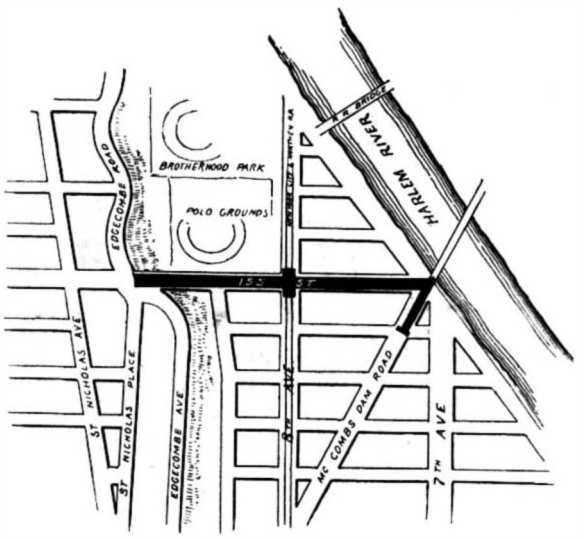
special extension of a generally triangular shape effects the junction of viaduct and bridge. When it is considered that it prolongs the ascent of the hill to about three times its present length, the easy grade afforded by it can be realized.

The general appearance of the structure is shown in the cuts. It consists of an elevated roadway fifty feet wide, with granite block pavement. On each side of the roadway are asphalt sidewalks, each ten feet wide. At the junction of 7th Avenue and the McComb's Dam road an abutment of masonry is established. The viaduct starts here on a level of 34·48 feet above the Harlem River. For about one hundred and thirty feet it is level. The up grade then begins, and for a distance of 675 feet the ascent is 4·791 feet in 100. This brings it to the line of 8th Avenue. An extension is located at this point directly over the elevated railroad station, which extension measures 70 feet on the axis of the bridge, and is 170 feet wide. The surface of this plaza is level, and four flights of steps descend from it to the street, communicating also with the elevated railroad. The up grade recommences, and for 725 feet it rises with a grade of 4·695 feet in 100.

It then reaches Edgecomb Avenue, attaining an elevation of 105 feet, a total rise of 71·48 feet. At this point an abutment and retaining wall is built. The principal view of the structure which we present is taken looking down from this point. The 8th Avenue plaza and the connection with McComb's Dam Bridge are clearly shown.



RAILING AND LAMP POST FOR 155th ST. VIADUCT.



MAP SHOWING LOCATION OF VIADUCT WITH REFERENCE TO HARLEM RIVER.

ELEVATION OF VIADUCT.

The structure in general is to be carried on two parallel rows of columns. These rest on foundations which will vary according to the ground. Where piling is required, it is to be of spruce or yellow pine, of at least 12 inches diameter at butt and 8 inches at point. Yellow pine is specified for the caps, to be secured to the piles by one inch round drift bolts 20 inches long. On the piling or on the rock, as the case may be, concrete foundation is established, which is reduced in area by steps until a definite plane is reached. A granite block 4 feet 6 inches square and 18 inches thick is then bedded upon it, and on this an iron casting or base plate is placed, held down by 1⅝ inch anchor bolts, which may be six feet long. On this plate the column is placed. It is of the box girder type, with lattice sides, and is built up of 3½ inch by ¾ inch angle irons and ⅜ inch webs. In general terms they are 18 inches square, and vary in height from 21 to 61 feet.

On the columns rest cross girders of the web or plate type. The standard size has 5 foot 6 inch webs, ⅜ inch thick. On these rest the longitudinal girders, of similar type, but in general with 4 foot 3 inch web, ⅜ inch thick. On these, again, the roadway is established by small cross beams, with the interstices filled up with ⅜ inch buckle plates having a rise of 3 inches in the crown. The road bed is brought to its proper contour by concrete, and granite blocks are placed on this surface.

The stringers or longitudinal girders are laid so as to have their expansion ends up hill. Faced bearings are provided, which rest on turned steel rollers.

The general specifications provide that power riveting is to be used wherever possible. Punched rivet holes are allowed in steel up to ¾ inch in thickness, but such holes must be ⅛ inch smaller than the rivet and must be reamed out to fit. For greater thicknesses drilled holes are to be adopted. In lattice work the sharp edges left by drilling or reaming must be eased off. For steel portions open hearth metal is prescribed of 36,000 lb. elastic limit and 60,000 to 68,000 lb. ultimate strength. All the main elements of the superstructure are to be of steel. Wrought iron is permitted for some subsidiary parts.

An ornamental railing and lamp posts are provided. One of the cuts gives a general view of these portions, whose appearance certainly indicates excellent taste on the part of the designer. The time for the completion of the work is placed at five hundred days from July 1, 1890. When completed it will be a most impressive structure, and one that will by its functions as well as appearance be a great addition to the upper portions of the city.

A Novel Application of Water Power.

One of the best examples of the utilization of waste water is that recently made at Watsonville, in California. The Corrillitos Water Company, of that place, get their supply from the Corrillitos Creek, at a point 7½ miles from the town. Their distributing reservoir is located 1½ miles distant, at an elevation of 90 ft. The water is brought from the Corrillitos Creek, 6 miles above, in a 15 in. pipe, and discharges into the reservoir under a considerable head. It occurred to the water company not long ago that this pressure might be utilized to light the town, and after conference with the Pelton Water Wheel Co., of San Francisco, the scheme was found to be perfectly practicable, and a contract was at once entered into with that company to erect the power plant, and with the Thomson-Houston Co. for the electric installation. The plant consists of a 4 ft. Pelton wheel, which runs under a pressure of 60 pounds, equal to a head of 140 ft., the water being discharged on to the wheel through a 2¼ in. nozzle. Close regulation is afforded by a deflecting nozzle and hydraulic governor, which gives perfect steadiness to the lights. The dynamo is a T. & H. alternating current, which runs three hundred 16 C. P. incandescent lights, the current being carried to the town, 1½ miles distant.

The power thus furnished, it will be seen, is from the waste water that has been absolutely valueless, and is so much clear gain to the company, the cost of operating the plant being almost nominal. The water after leaving the wheel falls into the reservoir, having been aerated and freshened to as great an extent as though it had been dashed over a cataract, thus incidentally accomplishing without expense just what is so much needed in such cases. This plant has been in successful operation some three months, and it is now proposed to put in an ice machine and thus utilize the power wasted during the day. There are probably hundreds of places all over the country where the same experiment can be repeated with corresponding results.

The Patton Electric Car Motor.

The basis of operation is the generation of electricity upon the vehicle, thus rendering each car independent, and dispensing with overhead or conduit wires for the transmission of electric force. By this system also all the obstacles which have rendered the service of many storage battery cars so unsatisfactory have been removed.

The gas engine runs continuously, and is geared to a dynamo generating electricity, which is received by accumulators, where it is stored for service as desired. An electric motor is geared to the axles, and the current necessary for the propulsion is admitted to the said motor in a greater or less degree, according to the power required at any given moment. Thus the movement of the car is entirely subject to the will of the operator, who can regulate the propelling force in accordance with the obstacles to be overcome. Meantime the storage batteries are kept continually charged by the engine and dynamo, so that reserve force is always in readiness for any emergency. The entire cost of maintenance of this power is 1·1 cents per mile. The engine, dynamo, and motor are carried upon a truck specially devised for the purpose, by which plan the car body can be removed very readily, and the same truck suffice for an open car in summer or closed car in winter. The batteries are arranged under the seats of the car. The motor car weighs, with the truck and all mechanism complete, 14,100 pounds, and has seating capacity for 30 passengers.—*Electrical Review.*

Cleopatra's Needle.

It was lately stated in the House of Commons that the inscriptions on Cleopatra's Needle are showing signs of decay. Mr. John Dixon, the contractor for conveying the monolith from Egypt, denies this and says:

After making a careful personal examination of the monument, my critical eye fails to detect upon its surface a sign of any decay whatever. Were there such, there could be no doubt there would be grains of the stone lying on the altar steps and top of the pedestal. I climbed up and could not see one sign of any decay. I also could see glittering points on the surface of the solution of silica supplied to me by the skilled chemists of the British Museum, at the suggestion of my old friends Sir Richard Owen and Dr. Birch, and of which three coats or washes were given with the greatest care before the trunnions and fastenings for the final lift were placed around it.

There is another reason also in the natural composition of this peculiar bed of syenitic granite that crosses the valley of the Nile at the First Cataracts, and from the quarries at the small village of Syene, from which all the known obelisks were cut, viz., the total absence of mica in the stone. In all other granites this readily destructible material exists. Moreover, it must not be forgotten the centuries that have passed away since this ancient monument was erected by the Pharaoh Rameses II. at the main gateway of his great temple at On, the Heliopolis of the Greeks. There it stood for eighteen centuries, and was about 23 years B. C. removed by order of Cleopatra to the palace she was erecting at Alexandria for her friend and constant visitor, Julius Cæsar. The architect appointed by her was Pontius, the father of Pontius Pilate, the Governor of Judea. The rounded corners of the bases of these two obelisks had doubtless been chipped off by the gatekeepers at On and sold to the pilgrim visitors. Pontius Architante had eight bronze crabs cast and placed them under the rounded corners of the stones, and on the big claw of one of the two crabs which alone remained was, when the pedestal was cleared of its surrounding sand, found this inscription: "In the sixth year of Augustus Cæsar, I, Barbarus, Prefect of Egypt, caused these obelisks to be erected by Pontius, the architect." Since then another nineteen centuries are passed, and even this 3,700 years of weathering has not erased one single portion of the hieroglyphs.—*The Architect, London.*

Keep Busy.

The secret of success in life is to keep busy, to be persevering, patient, and untiring in the pursuit or calling you are following. The busy ones may now and then make mistakes, but it is better to risk these than to be idle and inactive. Keep doing, whether it be at work or seeking recreation. Motion is life, and the busiest are the happiest. Cheerful, active labor is a blessing. An old philosopher says: "The firefly only shines when on the wing; so it is with the mind; when once we rest, we darken."—*Elmina.*

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WALL ORNAMENTS.

There is a great deal of satisfaction in the possession of home-made ornamental objects, because they are the work of one's own hand, and, besides this, they are not obtained by the expenditure of money that might, perhaps, be needed for other purposes.

Ornaments belonging to the wall go a long way in furnishing and beautifying the house. Pictures, carefully selected, are highly effective. Many of the modern photographs, photo-gravures, and photo-engravings which are really meritorious can be obtained for fifty cents or a dollar each. Some fairly good etchings and imitations of water colors are also sold at reasonable prices. The great item in connection with a low-priced picture is the frame; but any one with such tools as are commonly found about the house and with a small quantity of material can readily make a variety of frames worthy of any place in the house.

The simplest frame to make is that shown in Fig. 1. This is made from a narrow flat board of chestnut, butternut, or even ash or oak, having its inner edge rabbeted to receive the glass, mat, and backing. This strip is stained and finished before it is mitered. The staining is done by brushing the strip evenly with a thin coating of asphaltum, or with a thin stain of logwood, or with a stain formed of either of the following dry pigments, burnt umber, burnt or raw sienna, mixed with turpentine and a very small proportion of boiled linseed oil. Chemical ink or writing fluid, reduced with water so as to produce a greenish-gray tint, answers a good purpose.

After the stain is dry, the tint is lightened along the inner or outer edge of the strip, as taste may dictate, by scraping the wood by means of an ordinary wood scraper, or by rubbing the surface down by means of fine sandpaper. It is obvious that the stain may be applied to the wood in such a way as to graduate the tint without the necessity of scraping or sandpapering, but this requires practice.

The tint should be so graduated as to be very light,

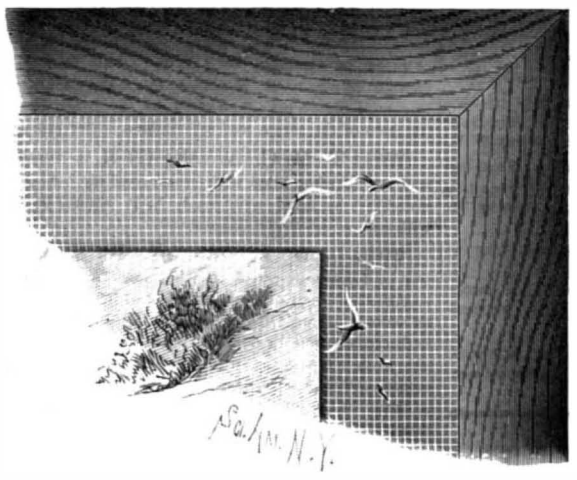

Fig. 1.—WOODEN FRAME.

or nearly the natural color of the wood at one edge of the strip, while the other edge should be quite dark. The strip may be finished by flowing over it three thin coats of shellac varnish, allowing each coat to dry thoroughly before applying the next. The first two coats should be rubbed down with very fine emery paper after they become thoroughly dry and hard. The last coat may be left bright, or its luster may be toned down by means of the fine emery paper. The moulding or strip thus prepared is mitered in the usual way by the aid of a miter box, and nailed and glued together at the corners.

The mat in this case consists of a piece of thick pasteboard in which is cut an opening of the desired form. The edges of the pasteboard are beveled around the opening, and canvas, crash toweling, or white or tinted cotton velvet is secured to the pasteboard by means of book binder's paste (flour paste with glue added). After the paste becomes dry, if desired, a design may be painted on the mat with water colors.

The frame shown in Fig. 2 is made on a different plan. In this case the wooden moulding is half round on its face. A saw kerf is made at the inner side of the rabbet. The edge of a strip of white or "ivory" zylonite is inserted in the saw kerf, and held there by a thin strip of wood glued in. A small percentage of glycerine or even common molasses should be added to the glue used for this purpose. The zylonite is wrapped around the moulding and fastened by means of a thin strip of wood laid over it and secured by small nails or brads. The corners of this frame are formed by means of rectangular blocks of wood painted white on their sides and furnished on the front with a square of zylonite held in place by an ornamental brass nail.

If a larger frame is required, that can be made with a single strip of zylonite, the joint may be covered by means of a curved half round strip of brass well polished and lacquered, and applied as shown in the engraving.

This frame may have a gilt lining as well as the mat. It has a very chaste appearance, looking much like a frame of ivory, and it is withal durable.

A very pretty and easily made wall ornament is shown in Fig. 3. It consists of a number of peacock feathers arranged radially or in the form of a fan with the quills attached to an elliptical piece of pasteboard by means of sealing wax. The pasteboard is fitted to

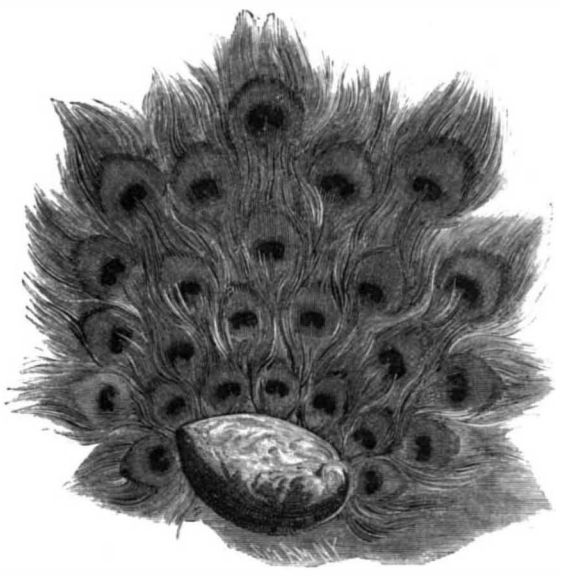

Fig. 3.—FEATHER ORNAMENT.

an iridescent shell and fastened in with sealing wax. A wire loop inserted in the pasteboard serves for hanging the ornament. It may be placed between windows, above or below pictures, and in many other places with good effect.

In Fig. 4 is shown a wall cabinet, which is not only highly ornamental, but very useful. The body of the cabinet is of pine or other soft wood. The doors are arranged to receive the beautiful zylonite bass-reliefs sold by the manufacturers of this superb material. In openings in the back of the cabinet are inserted ornaments of the same character. They resemble ivory and are very serviceable.

The body of the cabinet is neatly covered with canvas, toweling, or lightly tinted cotton velvet, on which are painted designs in water or oil colors. The edges of the shelves are preferably covered with sheet zylonite, although they may with good effect be covered with the material used on other parts of the cabinet. Ornamental brass hinges and taimmings should be applied to the doors, as shown in the engraving.

Between England and the Continent.

The *Building News* thinks there won't be any Channel tunnel ready for the holiday exodus of architects and students to the Continent this summer; but since Carlyle's well-known and oft-quoted saying seems wonderfully applicable to a large portion of the English nation, who, having a "right little, tight little island," would literally undermine its tightness and rightness by constructing a dry thoroughfare from it to the Continent, there seems some reason to believe that in days that have grown yet more evil, the tunnel will be commenced with serious intentions, be it ultimately finished or left incomplete. Of ideas and schemes there are plenty. What with tunnels and bridges, and a combination of the two means of crossing the silver streak, not to mention the marvelous designs for blowing up or flooding a tunnel at a moment's notice—a fascinating subject to reflect upon, one would think,

Fig. 4.—A WALL CABINET.

when in the bowels of the earth, midway between Calais and Dover!

The latest scheme, the details of which have been put before an admiring public, who take it all in for gospel, is that of M. Varilla, a Frenchman, who, according to the *Daily News* correspondent, "singularly resembles Napoleon." M. Varilla's scheme consists of bridges, combined with a tunnel. Piers or "bridges" would run out from the shores of either country, and at their extremities would be lifts to lower the trains into the tunnel. There is no denying the originality of the idea, which, it is to be supposed, was conceived with the object of rendering seizure of the end of a tunnel on the Watkin model impossible. Otherwise it might be docketed along with many other schemes as issuing direct from an inventor in Bedlam. The trains on this system would be run some way out to sea, let down 160 feet or 170 feet, run along the tunnel, up the lift in the twinkling of an eye, along the other bridge, or pier, and there you are—if nothing goes wrong with the works.

Electrical Railways.

In a recent lecture at the Franklin Institute, Philadelphia, Capt. Eugene Griffin said: "The success of electrical propulsion has been established beyond a question. It is only a matter of time, and that a short time, when it will replace the horses on the majority of our street railways. It is only a matter of time, a somewhat longer time, perhaps, when it will be the propelling power on all our elevated roads, for the elevated roads possess ideal conditions for the application of electricity. It is within the bounds of possibility that our steam roads will be run with electricity; certainly this power offers many advantages for the suburban traffic in the vicinity of the large cities. The possible utilization of hitherto neglected water powers will be one of the factors in determining the extension of electrical propulsion in this direction. Already we see the beginning. The West End Company, of Boston, are building longer cars, with radial and double swiveled trucks. The New York elevated roads are anxiously seeking a solution to the problem of how to enlarge their carrying capacity without rebuilding or materially altering their superstructures. Longer trains

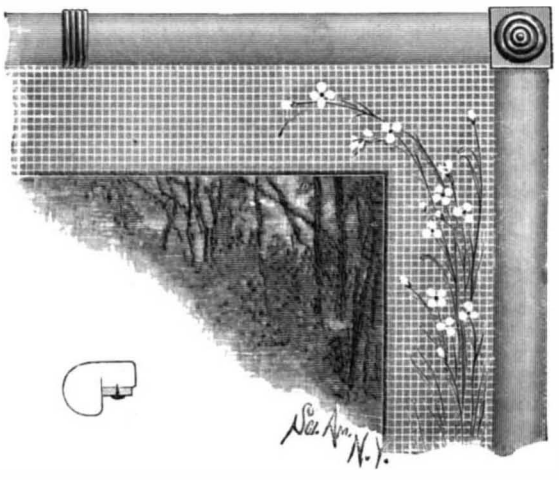

Fig. 2.—ZYLONITE FRAME.

are requisite to meet the increased demands. The limit of the capacity of the present locomotives has been reached. Increased weight in the locomotive means an immense expenditure for strengthening or practically rebuilding the roadway. Cables are not feasible, as the strain on the grip would not permit of long trains, and it would be difficult to combine speed and safety with any considerable increase in the number of trains. Cables would not permit of satisfactory switching arrangements at the termini and elsewhere. Electricity offers the best solution. Equip each car with motors. Flexible electrical connections can easily be made from car to car, as is now done on surface roads, to light the tow cars, and the whole train controlled by the driver on the front platform of the leading car. Electric, vacuum, or air brakes can be used in the same way. It matters not how many cars we have in a train—one or fifty. Each car adds its own power and all work together. There is no dead weight to pull, as in the case of the locomotive. The passengers themselves furnish the weight for traction. The switching arrangements present no difficulties whatever. The motors can be reversed and run equally well in either direction. The train can be controlled from either end and any increase or decrease in the number of cars will not affect the controlling mechanism.

"It is difficult to conceive of a more flexible system. It seems to be the ideal system for the elevated roads, and is bound to be adopted in the near future."

The Detroit International Fair.

Among Western enterprises of large note and importance this year, in which many readers will find departments of direct interest to their business, is the Detroit International Fair and Exposition, to be held in Detroit, Mich., August 26th to September 5th inclusive. The grounds of this exposition are among the finest, and its buildings among the largest and handsomest of any fair or exposition in the country. It offers a large and costly list of cash premiums. This great fair is continental in its scope, and embraces exhibits from all over the United States and Canada.

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RECENTLY PATENTED INVENTIONS.

Railway Appliances.

CAR COUPLING.—Charles E. Seabury, Stony Brook, N. Y. This device is designed to be simple, inexpensive, and automatic, whereby the cars may be coupled without requiring the train men to go between them, the coupling being also adapted to connect with the common link and pin drawhead.

CAR COUPLING. — Albert B. Evenden, Watertown, N. Y. This is a coupling also adapted for use with cars having the ordinary link and pin coupling, and with cars of different heights, the drawbar head having a hook or hooks upon its top, while there is a link secured to the head by a pin and slot connection and a joint in the link intermediate of its length, with other novel features.

CAR HEATER. — Charles O. Newton, Homer, N. Y. In accordance with this invention a hot air chamber extends under the entire floor space of the car, the steam pipe extending through such chamber under the central aisle, the exhaust pipe inclosing the steam pipe, and the invention covering various novel features of construction and combinations of parts.

Miscellaneous.

SAND BAND. — Humphrey Trembath, Evart, Mich. This is a guard for excluding sand, mud, and dust from the hubs of wheels and the spindles of axles, and has a hood in the form of a truncated cone with an open lower side, and large enough to allow the hub to revolve freely within without touching it, the hood being so hinged as to be freely raised for oiling, etc.

VEHICLE GEARING.—Paris Erb, Newport, Pa. This is an improvement in fifth wheel construction, the fifth wheel having its lower section provided with sockets or bearings and the clips having pivot studs or gudgeons adapted to fit in the bearings, whereby in descending a grade the vehicle will push forward and operate to tilt the axle back, and the shafts will be prevented from rising, and on a level or uphill grade the draught will turn the axle to hold the shafts up.

SLED KNEE. — John Ammon, Stoughton, Wis. This is a knee formed of plate metal, with upright, side, and top or crown portions, the upright portions being curved in cross section while the top or crown portion is curved or arched upward from side to side, the construction being designed to increase the strength and strain-resisting power of the knee.

BOB SLED.—Sven Legreid, Stoughton, Wis. This is an improvement designed to simplify and strengthen the rave attachment, the attachment having its base portion adapted to the upper end of a sled knee, and having its upright portions curved or arched in cross section, the attachment supporting the rave at its upper end, to which it inclines outward, and the beam being supported at its end therein.

NAIL KEG.—Henry E. Spilman, Spilman, West Va. This keg is composed of a transversely corrugated sheet metal cylinder, having detachable wooden heads made in sections, and adapted to be locked in end grooves formed by the corrugations, by being rotated about the axis of the keg.

MACHINE FOR HOOPING AND HEADING KEGS.—Theodore A. Cook, Brooklyn, N. Y. This machine has a header plate and a reciprocating upper table, in combination with a flange attached to the table to surround the barrel, a plate within the flange and spring-actuated hoop drivers pivoted therein, with other novel features, the machine being more especially designed for hooping paint kegs, etc.

VENTILATING BARREL. — John F. East, Norfolk, Va. This barrel is composed of a veneer blank cut through its middle, with transverse parallel slits, leaving the edges of the blank continuous or unsevered, while the middle portion is expanded to give the curve to the barrel and form ventilating openings.

BELT REPLACER. — Frank Balderson, Oketo, Kansas. This invention consists of a segment adapted to be clamped to the rim of the pulley and to project in line therefrom, a curved arm being pivoted to one end of the segment, the device being simple and durable, and calling for but little labor to place the belt on the pulley or wheel.

DISCHARGE VALVE FOR SEWER PIPES.—Charles H. Shepherd, New York City. This is an automatically operating valve designed to open under a given pressure of water, and close as soon as the water is discharged, the invention covering novel features of construction and arrangement of parts.

GRADING AND DITCHING MACHINE.—Rector M. Thompson, Crawford, Neb. This is a machine in which the scoop is designed to be expeditiously elevated when loaded, carried above the surface of the ground and readily dumped, there being a frame with an attached caster wheel at the rear of the scoop, taking the weight off the team and preventing dirt falling from the scoop when elevated and loaded.

MOTOR. — Frank L. Gilbert, Conroe, Texas. This is an actuating lever mechanism to be attached to a loose seat board mounted on an ordinary stool or high chair, and adapted to convert the slow downward movement of the seat when occupied by an operator into a rapid rotary motion for the running of a sewing machine or similar purpose.

OVEN SLIDE.—Harry T. Gilbert, Philadelphia, Pa. This invention consists of a hinged extension plate provided with a cam edge, a vertically arranged shaft having a cam arm adapted to engage the cam edge, and an arm secured on the shaft and operated on by the closing of the stove door.

SCRAPER FOR ROLLER MILLS. — John Harvey, Brooklyn, N. Y. This is a device for the removal of crushed grain from the rolls of a roller process mill, and is adjustable and non-abrasive in contact, while designed to be thorough in operation and avoid all danger of fire from its action on the rolls.

HORSE POWER APPARATUS. — Oscar Johnson, Lindsborg, and Nels A. Holtman, Smolan, Kansas. Combined with a revoluble platform having radial arms with tension or lock latches, and a belt or cable, are equalizing links to which draught attachments are pivoted, with other novel features, and whereby the team may be attached within the circle of the driving belt and near the outer end of the lever arm of the apparatus.

TELEGRAPHY. — Shirley M. English, New Orleans, La. This is an invention designed to overcome the defects of "light sending," and to insure a good connection at the contact points of the instrument, there being combined with a vertically swinging lever and a second lever actuated therefrom and connected with the main line, two pivoted arms connected with opposite poles of a battery, a spring insuring contact of the second lever with the arms.

VEHICLE SEAT LOCK. — Henry A. Lombard, Saco, Me., and John R. Rankin, Wells, Me. This is a device enabling the operator to conveniently place the seat in position without going between the wheels, and whereby the seat may be tilted without being disconnected, for convenience in loading the vehicle and to keep the seat dry when not in use.

GLAZED STRUCTURE. — William H. Coulson, Jersey City, N. J. This invention relates to a structural improvement whereby the glass or similar substances may be laid in a metallic frame without the use of putty, provision being made for the disposal of rain and condensed vapor, and the invention covering various novel features and combinations of parts, to accomplish desirable results in a simple and practical manner.

SASH HOLDER. — John Schofield, Holyoke, Mass. This is a sash support having a bracket frame and a curved plate spring coiled at each end into volute scrolls that are attached to the bracket frame, being designed for ready application to new or old sash, and to hold either the upper or lower sash at desired points of adjustment.

MOSQUITO CANOPY.—Augustus Miller, Hoboken, N. J. This is a device by which the netting to be spread over the bed may be rolled up when not in use, and in which the netting is so attached to the roller that when it is drawn out therefrom one section may be folded down at each side of the bed and a third section at the foot.

SYRINGE ATTACHMENT. — Alfred E. Charlesworth, Seattle, Washington. This invention is designed to provide a simple and convenient attachment, with a peculiar construction of the various parts and their novel combination.

SCIENTIFIC AMERICAN·

BUILDING EDITION.

JUNE NUMBER.—(No. 56.)

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1. Plate in colors of an elegant residence at Montclair, N. J. Munn & Co., architects, New York. Perspective view, also a plate showing the north and rear sides, floor plans, sheet of details, etc.
2. Elegant colored photographic plate, with floor plans, sheet of details, etc., of a cottage at Blythebourne, L. I. Estimated cost $3,200.
3. Residence at Yonkers, N. Y. Perspective view and floor plans. D. & J. Jardine, architects, New York. Cost, $10,950.
4. A residence at Orange, N. J. Perspective views, floor plans, etc. Cost about $12,000.
5. Perspective view and floor plans of a residence at Holyoke, Mass. L. B. White, Holyoke, Mass., architect. Cost complete, $6,000.
6. Sketch of two old Bristol houses.
7. Sketch of hotel and Post Office, Dartmouth.
8. A Casino erected at Springfield, Mass. Cost complete $12,000. Floor plan and perspective.
9. A church recently erected at Greenwich, Conn., at a cost of $13,000 complete. J. C. Cady, architect, New York. Ground plan and perspective elevation.
10. View of the entrance to the United States Trust Company's building, Wall Street, New York.
11. A dwelling at Yonkers, N. Y. Cost complete $5,000. Floor plans and perspective elevation.
12. Elegant residence at Stamford, Conn. W. R. Briggs, architect, Stamford, Conn. Cost $15,000. Floor plans and perspective.
13. View of the iron and wood gate in front of the entrance to the Press Pavilion at the recent Paris exposition.
14. Miscellaneous Contents: Fireproofing wooden floors.—"Peach bottom" slate.—The manufacture of granite. — The lien law.—Combustible architecture.—Variety in Gothic architecture.—New No. 9 double cylinder planer and smoother, illustrated.—A sliding Venetian blind, illustrated.—The Holmes spur feed slitting machine, illustrated.—Get sound titles to your real estate.—Heating apparatus for a wagon factory.

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The best book for electricians and beginners in electricity is "Experimental Science," by Geo. M. Hopkins. By mail, $4; Munn & Co., publishers, 361 Broadway, N. Y.

For Sale—Ornamental chimney top patent. Prevents the rain from washing the mortar from between the bricks. Address for further particulars, F. Maurer, 208 Lincoln Ave., Peoria, Ill.

The whole letters patent on the oil can illustrated on page 389 will be for sale, at a reasonable price, for the next sixty days. If not sold then, will want a reliable manufacturer to make in large lots, for cash. Address patentee.

☞ Send for new and complete catalogue of Scientific and other Books for sale by Munn & Co., 361 Broadway, New York. Free on application.

Notes & Queries

HINTS TO CORRESPONDENTS.

Names and Address must accompany all letters, or no attention will be paid thereto. This is for our information, and not for publication.
References to former articles or answers should give date of paper and page or number of question.
Inquiries not answered in reasonable time should be repeated; correspondents will bear in mind that some answers require not a little research, and, though we endeavor to reply to all, either by letter or in this department, each must take his turn.
Special Written Information on matters of personal rather than general interest cannot be expected without remuneration.
Scientific American Supplements referred to may be had at the office. Price 10 cents each.
Books referred to promptly supplied on receipt of price.
Minerals sent for examination should be distinctly marked or labeled.

(2272) G. B. asks (1) if there is a difference between mineral wool and asbestos. If so, what is it? A. Mineral wool is made artificially by blowing melted slag or glass into threads by steam. Asbestos is a natural mineral. 2. What is the liquid used by the so called "fire eaters," that they use on their hands before handling red hot iron, etc.? A. Dilute sulphuric acid or very strong solution of alum. Your other query will be answered later.

(2273) C. H. asks (1) if benzoin can be deodorized. A. No. 2. How can it be reduced? A. It is soluble in alcohol.

(2274) A. B. S. asks: 1. Is there any process by which the strong odor in the spirits of turpentine can be taken away, and if so, would the strength of the turpentine be reduced? A. Redistill from a solution of caustic potash; it will not impair its quality. 2. If equal parts of white wine vinegar and alcohol be put together in a bottle, would the alcohol turn to vinegar, and if so, how soon? A. Yes, if air is admitted; the time cannot be stated. 3. Is there any difference between the oil and spirits of turpentine? A. No; they are synonyms.

(2275) V. H. asks: Can cement be softened or loosened from the joints of terra cotta sewer pipe, without breaking the pipe? If so, how? A. No. 2. What is the average width across the shoulders of a man? A. It depends on the race. 3. What is the average length of a man's arms? A. About 6 feet from hand to hand when extended. This also depends on the race. 4. Can a person that is deaf in one ear hear a phonograph? And if so, how would you arrange it? A. Yes; no special arrangement is needed. 5. How can candle grease spots be taken out of soft woolly cloth? A. Scrape off all that will come. Then place a piece of blotting paper over them and iron with a hot iron. 6. Do you recommend a trade school to learn a trade in, or the ordinary way of apprenticing, for the time it takes to learn it? A. The trade school.

(2276) C. S. W. asks: 1. Is aluminum a good conductor of electricity? A. Yes; about half as good as copper. 2. Does a dynamo when running generate new electricity, or does it bring under control and use that which is already in the atmosphere? A. It converts mechanical energy into electrical energy. As we do not know what electricity is, we cannot speak of it in the sense of an entity as you do. We cannot consider it as being a substance "present in the atmosphere."

(2277) L. B. L. asks (1) where a given day begins, that is, where on the earth's surface was it first May 10, 1890? A. At 180° longitude east from Greenwich. This is the best that can be said on the subject, as it is not to be regarded as an absolutely fixed thing. 2. Does the dynamo create electricity? A. The dynamo converts mechanical energy into electric energy. Until it is settled what electricity is, we cannot consider the question of its creation. Your other suggestions are not valid.

(2278) W. F. C. asks: 1. B says that gunpowder will not burn in a vacuum. C says that it will. Which is right? A. C is right. 2. If a balloon rises to the height of eleven miles with 1,000 pounds ballast, and the ballast is then thrown out, will the balloon rise any higher? A. Yes.

(2279) J. C. O. asks (1) for a non-odorous disinfectant; is there any cheaper or better than common copperas dissolved in hot water? A. The advantage of copperas is that it is not highly poisonous; the disadvantage is that it stains tissues, and under some conditions even porcelain. It is very efficacious. Sulphate of zinc probably surpasses it, but is poisonous. 2. What are the ingredients used in the solution for dipping old brass fixtures or ornamental brass work or chandeliers, etc., to make them look clean? A. Wash with beer. Dipping acid is not applicable except where they are to be relacquered, etc.

(2280) W. P. B. asks: Can you give me a solution for platinum plating (with battery) a pair of crucible tongs of German silver? A. No really satisfactory solution for the deposition of platinum by battery as a solid coating has yet been devised. One formula directs the addition to a solution of sodiochloride of platinum of a little oxalic acid. Then enough caustic soda is added to make it alkaline. Platinum plates may be riveted to the inner faces of the jaws of the tongs, and will make a better job.

(2281) T. M. C. A. asks (1) if a balloon will ascend when filled with compressed air. A. No. 2. Should it be filled with gas? A. It should be filled with gas.

(2282) L. W. T. asks for the construction of a lightning arrest for telegraph. A. In the SCIENTIFIC AMERICAN SUPPLEMENT, No. 752, you will find an account of Mr. Oliver Lodge's lightning protectors. Ordinarily a metallic comb or plate with edge filed into saw teeth is connected to line wire outside of instruments, and similar plate with its teeth facing and close to those of the first is connected to a "ground," which latter must be very good.

(2283) C. E. L. writes: I have a very fine "sciopticon," but I find it inferior for exhibitions, on account of oil light not being bright enough. Please say if there is any other fluid that can be used safely in same burner that will give better results, or can I improve on the old light by adding something? A. The oxyhydrogen or lime light is, probably, all things considered, the best for ordinary use. The electric light is superior, but is not always applicable. Portable oxygen generators are now sold by dealers in magic lantern supplies. There is no "fluid" such as you ask for. A little camphor may be dissolved in the oil.

(2284) J. M. M. writes: I want a few good formulas to make colognes. Could you furnish me them? A. As a rule there is considerable difficulty in procuring a good cologne. The alcohol should be deodorized, and probably it is best after addition of the citron oils to distill, and then to add to the distillate the other oils. The following is a typical formula:

Oil of bergamot	4	fluid ounces.
" " lemon	1½	" "
" " neroli bigarade	3	" "
" " rosemary	3	" "
" " cloves	½	" "
" " rosemary (best)	½	" "
Deodorized alcohol	2½	gallons.
Rectified spirit	1½	"

Other formulas are given in Cristiani's "Perfumery and Kindred Arts," which we can supply by mail for $5.

(2285) J. S. N. asks (1) how to make a table relish such as is sold in bottles by grocers. A. The following is given as the formula for Worcestershire sauce: Mix together 1½ gallons white wine vinegar, 1 gallon walnut catsup, 1 gallon mushroom catsup, ½ gallon Madeira wine, ½ gallon Canton soy, 2½ pounds moist sugar, 19 ounces salt, 3 ounces powdered capsicum, 1½ ounces each of pimento and coriander, 1½ ounces chutney, ¾ ounce each of cloves, mace, and cinnamon, and 6½ drachms asafœtida dissolved in 1 pint brandy 20 above proof. Boil 2 pounds hog's liver for 12 hours in 1 gallon of water, adding water as required to keep up the quantity, then mix the boiled liver thoroughly with the water, strain it through a coarse sieve. Add this to the sauce. 2. In making flavoring extracts such as perpermint, checkerberry, etc., how much coloring is used for the different extracts, if made by the gallon? A. No coloring whatever should be used. 3. How is ammonia (such as is sold in bottles by grocers, etc.) made—materials, amount of each? A. Sulphate of ammonia is treated with water and lime in a still and heated. The gas evolved is passed through water, which absorbs it. A small amount of a fatty acid or similar compound may be added. 4. Name of a book (if you know of any such)

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treating on laundry blue, blacking, inks, and flavoring extracts. A. We can supply the Techno-Chemical Receipt Book, $2.

(2286) S. H. P. writes: Can you tell me what will take the stains made by poison ivy juice out of a handkerchief? I pulled up some sprouts of ivy, and to save my hand from danger, covered it with a handkerchief, then threw that into a tub of water overnight, and the next morning it was covered with black spots, looking like ink or thin tar, and the usual washing and boiling didn't move them at all. A. We advise you to try the effect of Javelle water, followed by a weak solution (1 to 20 or less) of oxalic acid, washing out the handkerchief thoroughly between and after both applications.

(2287) A. E. H. asks for a receipt for making a paste or glue that will strongly fasten felt or thick woolen goods to iron or steel. A. Soak pulverized shellac in ten times its weight of strong ammonia. It will eventually form a transparent liquid. Or to rather thin hot glue solution add tannic acid until sticky and curdled and apply at once.

(2288) J. J. Y. asks: What cheap fluid, and one that will mix thoroughly, can be used to thin vegetable tar? A. Benzine or turpentine.

(2289) C. D. asks (1) how butter can be renovated and colored. A. Butter color is sold for the purpose. Bad butter cannot be renovated. Treatment with lime water and other chemicals has been suggested. 2. How can eggs be packed so they will keep fresh for winter markets? A. Eggs are preserved by being dipped in melted paraffin or by being packed in a barrel with lime water.

(2290) G. R. writes: By adding potash lye to flour and water you make a paste the same as by boiling. What can I add to this to prevent from souring? A. Add one part salicylic acid to 1,000 of the paste.

(2291) G. M. E.—The sample sent is galena or sulphide of lead.

(2292) O. McN. asks: How are crayons, such as those used in the public schools, made? A. By compressing proper materials, such as sulphate of lime.

(2293) W. E. A. asks: 1. What is the best make of dynamo and motor that one could use to transmit 40 horse power 200 yards over dikes, etc., where rope transmission would be impracticable? A. Any of the principal makers could supply you with machines for this purpose. 2. What power would be required to run the dynamo to obtain 40 horse power from motor? A. About 54 horse power. 3. Would a current of 110 volts E. M. F. with the proper strength develop 40 horse power in a suitable motor? A. Yes. 4. What is the least E. M. F. and amperage practicable to develop the above power? A. 746 watts constitute an electrical horse power; $746 \times 40 = 29,840$, the number of watts required. This amount divided by the E. M. F. will give the current in amperes, or if divided by the current in amperes it will give the E. M. F. in volts. 5. Can I build a dynamo and motor of the same pattern as the 8 light dynamo described in SUPPLEMENT, No. 600, to obtain the above mentioned power? A. Yes; but it would not be advisable for one inexperienced in dynamo building to attempt a job of this magnitude. It would be better and less expensive for you to purchase from reliable makers. 6. Are the different field magnets in use patented? Also, has not the patent on the Gramme armature expired? A. There are patented field magnets, but the ones commonly in use are not patented. The Gramme patent is not in force.

(2294) J. A. M. asks for a solution of the following questions by algebra: 1. Says B to A, give me one of your apples and I will have twice as many as you. No, says A to B, give me one of yours, and we will have both the same. A. The statement gives the following equations: Let A's apples $= x$, and B's apples $= y$

$$(1)\ y + 1 = 2(x - 1)$$
$$(2)\ x + 1 = y - 1$$

Solving by regular process, we find $x = 5$, $y = 7$. 2. In any right-angled triangle whose base is known (say 40 feet), and also the sum of hypotenuse and altitude (say 60 feet), to find length of hypotenuse and base respectively. A. Let $= x$ hypotenuse, and y = altitude. We then have the following equation from the properties of a right-angled triangle:

$$(1)\ y^2 + 40^2 = x^2, \text{ or } x^2 - y^2 = 1,600$$

From the statement we have the following equation:

$$(2)\ x + y = 60$$

Dividing (1) by (2) we have (3) $x - y = 26{\cdot}66$. Solving the simultaneous equations (2) and (3) we find:

$$x = 43{\cdot}333,\ y = 16{\cdot}666.$$

(2295) I. S. asks: Is it possible to succeed in photography with any of the advertised outfits, without first serving an apprenticeship to the business? A. Yes; with a few practical lessons from an experienced photographer you can succeed. To do satisfactory work, a good lens must be used.

(2296) C. E. W. asks for a recipe for making a cement or glue which will stick paper to polished iron. I wish to use it for covering pulleys. A. Roughen the face of the pulleys with a file, and use the toughest light brown glue that you can find, or fish glue.

(2297) C. F. H. asks for the formula of "paste diamonds." A. The following are representative formulas:

	I.	II.	III.
Silica	100	100	100
Red lead	156	00	164
White lead	00	171	00
Caustic potash (pure)	54	32	56
Boracic acid	7	9	6
Arsenious acid	3/10	1/5	1/100

Melt together to form a glass.

(2298) C. L. asks what country owns the fastest and best fighting ship in the world, and what our government is doing in this direction. A. The new British war ship Blake is claimed to be the fastest and most formidable war cruiser afloat. She has a displacement of 9,000 tons, length 375 feet, beam 65 feet, draught 25 feet 9 inches, twin screws, 20,000 horse power, maximum speed, 22 knots per hour, or over 25 miles. As a ram, at this high velocity and her great weight of 9,000 tons, it is doubtful if any vessel could withstand the shock. The Blake is constructed of steel throughout, has six inch armored turtle back steel deck covering the magazines, torpedo rooms, engines, and boilers. Fuel space, 1,500 tons. She is to carry two 9 inch 22 ton breech loaders and ten 45 pounder quick-firing guns, each capable of firing 12 times per minute, worked by two men, and will pierce 12 to 15 inches of armor plate. Cost, $1,840,000. We have as yet nothing that approaches this ship, but Congress has authorized the construction of one, known as cruiser No. 2, bids for which were recently opened at the Navy Department, Washington. It will be three years before she can be built, and the indications are that faster and better examples will be brought out in other countries. Armored cruiser No. 2 is to be of 8,100 tonnage, and is the largest vessel ever designed for the United States Navy. She will be armed with six 8-inch, and twelve 4-inch breech loading rifles, is to develop 16,000 indicated horse-power and a speed of twenty knots. Her dimensions are: length, 380 feet; extreme breadth, 64 feet 2½ inches; depth in hold, 41 feet 3 inches. Her armor varies from four to ten inches in thickness.

The new Russian torpedo boat Adler, lately built, proved on trial to be one of the fastest vessels afloat. Her mean speed during two runs was 26·55 knots per hour, or a litle over 30 miles per hour. She is 152 ft. 7 in. long, 17 ft. wide, 150 tons displacement, 2,300 h. p. It would seem as if a much larger vessel having a still higher speed might be designed and constructed. It would be a grand thing for some of our enterprising countrymen to accomplish.

(2299) W. M. asks for how long copyrights for books run, and whether the copyright is the same as a patent for an invention, and what is the fuss they are making in Congress about copyrights? A. A copyright runs for 28 years with privilege for a renewal of 14 years, making 42 years in all. A copyright is similar to and is virtually a patent. That is to say, a copyright secures to the holder the exclusive right to reproduce the book, and no one may print it without becoming liable as an infringer. Copyrights are granted to citizens of the United States, and to foreigners who are resident here; but foreigners who are not resident here cannot obtain copyrights. The "fuss" in Congress relates to an effort made to allow foreigners to take these 42 year copyrights or book patents. The bill has been defeated. It is being again urged, chiefly by the wealthy book publishers, as it would facilitate them in forming trusts to put up the prices of all books. One trust already has been formed, namely, the American Book Company, which has a capital of five millions of dollars, and has secured the control of the copyrights of most of the leading school books used in this country. It is believed the copyright law can be amended in such a way as to benefit foreign authors, and yet prevent publishers from forming combinations to advance the prices of books. The bill lately defeated was obnoxious chiefly because it secured little to authors, and nothing to the public, but helped the rich publishers to grow richer at the expense of the people.

(2300) W. M. asks how long a horse can go without food and water? A. We do not know as to horses, but it is stated that after the recent fire in the Neilson 750 ft. shaft of the coal mine at Shamokin, Pa., twelve mules were found alive in the mine that had been without food or water for 26 days.

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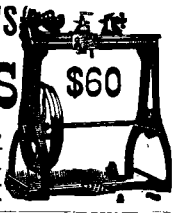

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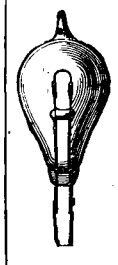

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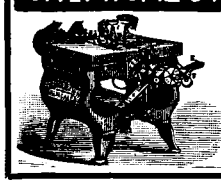

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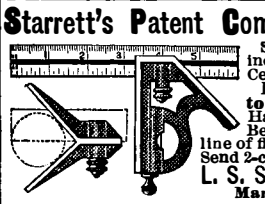

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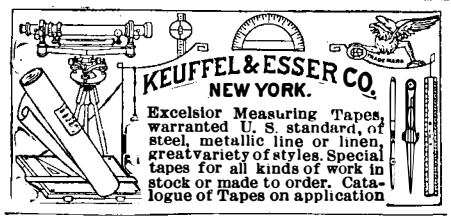

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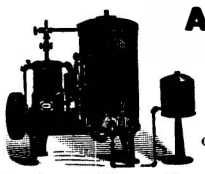

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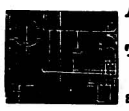

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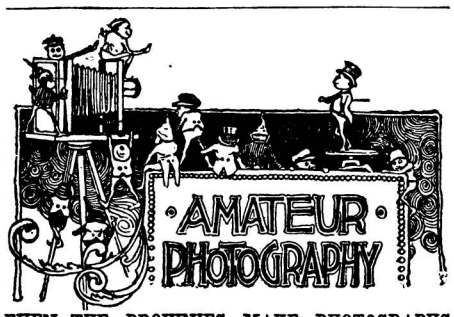

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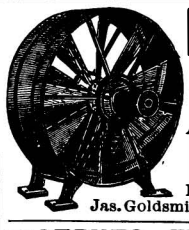

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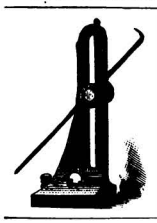

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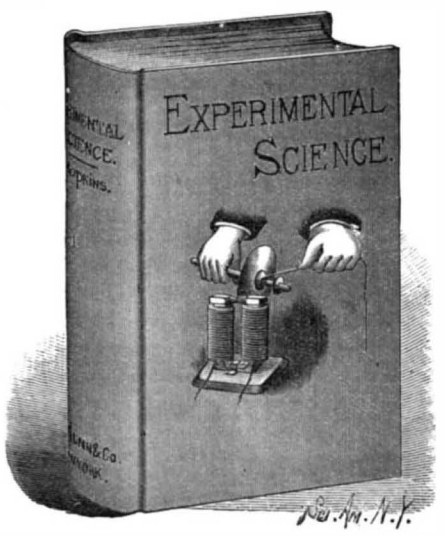

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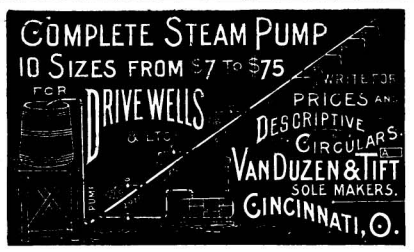

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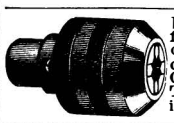

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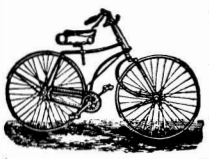

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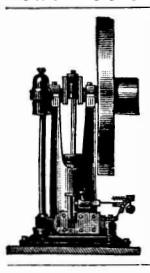

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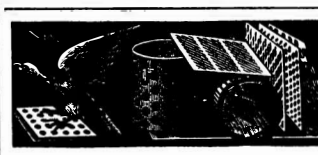

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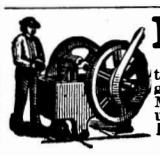

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